ELECTRICAL REVIEW

11th DECEMBER, 1953

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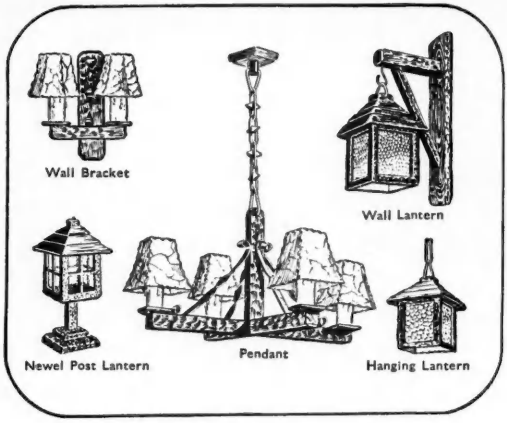

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ELECTRICAL REVIEW 11th DECEMBER, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. 153 • NO. 24

Approach to Russia

SOME months ago we began to receive communications from a body called the "British Council for the Promotion of International Trade" and describing itself as "a non-profit making organization whose general object is to promote international trade without regard to geographic and other barriers . . . composed of business men, economists and others who are concerned with the decline of Britain's foreign trade and who believe that an improvement in our trade position would result from the removal of unnecessary restrictions and particularly from an increase of trade between East and West."

We must confess that at the time we were a little suspicious of the Council's origin and motives and we were confirmed in our attitude by Mr. Thorneycroft, President of the Board of Trade, who told a questioner in the House of Commons in February last that the Council was an offshoot of the 1952 Moscow Conference, which was as much political as commercial in character. More recently, Mr. Eden, the Foreign Secretary, also questioned the Council's bona fides, although he appeared to favour the exchange of business visits by nationals of the United Kingdom and the Soviet Union.

It is still an unfortunate fact that any dealings with Russia and her associates have to be conducted in a sceptical frame of mind, but that is not to say that any contacts should be avoided. It is always possible that, even with the Russians, economic needs may over-ride political considerations. That seems to be the view of a number of British industrialists (who certainly cannot be suspected of being "fellow travellers"), including several representatives of the electrical industry. As will be learned from a statement reproduced in this issue, the latter group was to have joined a party for a visit to Russia under the auspices of the Council but when, after Mr. Eden's statement, many firms seceded from membership the arrangements were cancelled. Now these people

have decided to go to Moscow " under their own steam " after Christmas (provided they secure Russian consent) and they seem hopeful that business will result from their trip. With the present drooping tendency of export trade any possibility of making up losses should be examined and seized, if this can be done without damage to our defences or to our relations with our allies.

TRANSATLANTIC LINK

Last week's announcement that a telephone cable was to be laid across the Atlantic foreshadows one of the outstanding engineering feats of the century. The design and manufacture of the coaxial cable which is to be employed will in itself be a remarkable extension of present-day technique and the actual laying (by the Post Office cable ship *Monarch*) will be a momentous piece of work. Some details of the cable are given in this issue. When the service is available it will afford thirty-six high-grade, reliable circuits between this country and North America. At present there are fourteen radio-telephone circuits which are often interfered with by atmospheric disturbances.

FUEL POLICY

In the Lords debate on fuel policy last week Viscount Ridley again put his foot down on proposals purporting to secure the " best " use of coal, gas and electricity by defining or directing which fuel should be used for particular purposes. He pointed out that the basis of the Government's policy of discouraging the use of electricity for space heating was shortage of plant—not the amount of coal consumed. He reinforced the views of the Committee of which he was chairman by saying that if the prices of fuels corresponded with the services the consumer obtained and if the consumer was encouraged to use the fuels in the most efficient way, it would turn out that the best use of fuels in the national interest would, in fact, prove to be the use which people wanted to make of them.

THE ONE-DAY STRIKE

By the organizations responsible for calling it, last week's 24-hour strike in the engineering industry was considered a success. It was certainly successful in depriving the country of a day's badly-needed production. The men's cause was hardly furthered by the demonstration and the prohibition of overtime and piecework, if carried into effect, will result in hardship to the workers and further damage to the country's economy. We have already insisted that the dispute must eventually form the subject of arbitration or inquiry. It is to be hoped that the parties to the dispute and the Government will not let the threatened " trial of strength " happen first.

RELIEF FOR RETAILERS

Purchase tax is a most unsatisfactory revenue-raising device from all, save the Treasury's, points of view. The principal sufferers are, of course, the public, but the tax has become a greater bugbear than ever to manufacturers and traders since the tendency has been to reduce the tax. Months before the introduction of the Budget, trade in taxed goods begins to fall off, and if there are reductions retailers are left with stocks upon which they have paid tax at the higher rate with little chance of recovering it from the public. Consequently there has been an urgent need for some method of surmounting this obstacle to trade. " Sale or return " systems have been approved but have been found unsatisfactory. It is therefore to be hoped that the Chancellor will give sympathetic attention to a tax-rebate scheme which a number of electrical associations and others have put before him and of which details are given on page 1332 of this issue.

Progress in Dielectrics

By S. WHITEHEAD

D.Sc., M.A., M.I.E.E.*

This article has been prepared at our special request. It is based on a paper which Dr. Whitehead presented at this year's meeting of the British Association for the Advancement of Science at Liverpool

A CENTURY and a quarter ago Faraday insulated his apparatus with silk, cotton and paper, sometimes waxed, also varnished wood, glass, paraffin wax, bitumen, amber, sulphur and quartz. Oil and rubber were known and shellac was quite widely used as a varnish and otherwise. Mica was known but not much used. A century later the situation had changed little in fundamentals. Insulating oil had become important but was employed to reduce flash-over distances so as to avoid discharges in spaces otherwise occupied by air and to dissipate heat. Phenol-formaldehyde resin, Bakelite, had been invented and, together with natural resin, had permitted the wide use of varnished paper and varnished cloth, together with mouldings which started the plastic industry. Paper was also impregnated with viscous compounds. Ebonite characterized the high grade instrument and was the first instance of the deliberate chemical incorporation of an improving element. These developments, though not basic from a scientific aspect, were associated with magnificent engineering achievements. The foundations of electrical engineering were completed in the period.

The engineer's influence had led to the classification of materials according to how they were assembled or used in a design and how they could be fabricated by processes such as by machine tools, moulding, casting, pouring and painting. The materials were thus first chosen for mechanical suitability. Whether they were good dielectrics was a matter of chance. If poor then an attempt was made to improve them. Unfortunately science provided little more than the macroscopic theory of the electric field, which led to improved methods of measurement and assessment, and obvious measures such as the removal of and preservation from electrolytic impurities. Nevertheless, the better drying, vacuum impregnation, better sealing and pH control which arose reduced the loss angles of 0·01 to 0·05 for satisfactory insulation in 1920 to one-third of these values a decade later. These advances made possible the great development in electricity supply in those times.

New materials were still improvisations. Variants of Bakelite were not fundamentally superior electrically, they had come about mainly as an alternative to pottery. Except for cellulose triacetate, cellulose compounds, developed as transparent papers, were too polar, causing a high loss angle and susceptibility to moisture. This also applied to acrylic resins like "Perspex," primarily intended to replace glass. This empiricism gave place to the search for types of structure and composition which, on theoretical grounds, could be expected to yield good electrical results. The transition was gradual because it depended on contemporary advances in the physics of the solid state and also in chemistry and chemical engineering without which the new materials would have been too costly.

In this field the theoretical physicists often pointed out the directions of advance and they deserve a good share of the credit. The main principles found useful are:—

(1) Certain atoms tend to be more tightly bound in combinations and are more resistant to thermal activation, ionization and chemical attachment. In suitable chemical groupings silicon and sulphur are preferable to carbon, fluorine and chlorine to hydrogen, nitrogen to oxygen.

* Dr. Whitehead is Director of the Electrical Research Association.

(2) The insulating property arises from the absence of free electrons because there is a large energy difference between the conduction zone and the filled bands of electrons attached to atomic groups. Electrons do not trap themselves. Thus free electrons must be prevented from emerging, which implies that the structure should have as few imperfections as possible capable of loosely trapping electrons which later escape by thermal agitation and other interactions.

(3) The infra-red rotation spectrum might sometimes be conceivably broadened by thermal collisions so that it could affect the electromagnetic range. This has not been observed, so that the electrical properties of solids and liquids are dominated by the relaxation spectrum which arises from specific dipoles in the molecule or in impurities such as moisture (1 mobile ion in 10^{12} molecules can affect the permittivity and loss angle), or from an electric moment caused by asymmetry or distortion. The spectrum is superposed on a kind of "noise" arising from a continuous distribution of relaxation times which often gives a nearly constant loss angle in good dielectrics (Fig. 1). The relaxation spectrum extends from zero to about 10^{10} c/s. In liquids the dipoles are distributed in all directions and the relaxation time is given by the rate at which the distribution can follow the applied field. In solids only certain directions are possible and the relaxation time depends on the rate at which dipoles can be reversed. In addition dipoles favour dissociation causing ionic conduction, particularly at high temperatures.

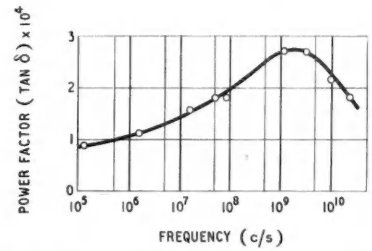
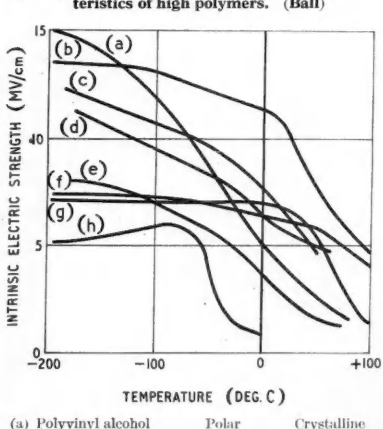


Fig. 1.—Loss angle of polythene. (Willis Jackson)

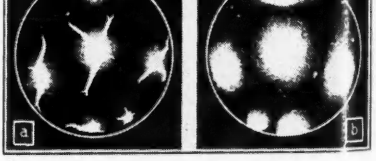
Fig. 2.—Electric-strength/temperature characteristics of high polymers. (Ball)



(a) Polyvinyl alcohol	Polar	Crystalline
(b) Polymethyl methacrylate	Polar	Amorphous
(c) Polyvinyl chloride-acetate	Polar	Amorphous
(d) Chlorinated polythene (55% chlorination)	Polar	Amorphous
(e) Clear baking-oil varnish	Polar	Amorphous
(f) Polystyrene	Non-Polar	Amorphous
(g) Polythene	Non-Polar	Crystalline
(h) Polyisobutylene	Non-Polar	Amorphous

(4) Breakdown is of four main types. The intrinsic electric strength is the limit of stability of electronic energy, beyond which the electrons will ionize the atoms of the structure. When the free electrons are rare or by chance as at low temperatures or in good crystals, the electric strength is constant or infrequently rises with increase of temperature. At higher temperatures or if dipoles or other imperfections are present, there are many loosely trapped electrons which provide free electrons as the temperature rises and so decrease the electric strength, which thus ultimately falls although there may be a constant range before the fall happens (Fig. 2). Since imperfections scatter electrons, making them lose more energy, the low-temperature

Fig. 3.—Discharges between photographic surfaces at 1·2 times inception voltage δ/Vi (a) Negative surface; (b) Positive surface. (Mason)



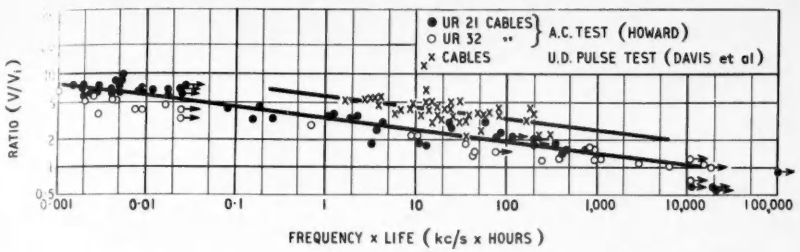


Fig. 4. **Relation between the life of polythene cables and the ratio of the test voltage V to the a.c. inception voltage Vi**

electric strength is increased by dipoles and imperfections but the high-temperature electric strength is decreased because there are more free electrons. The intrinsic electric strength can be calculated from structural data to within the accuracy of measurement, without disposable parameters—a remarkable achievement. The values mainly lie in the range from 1 to 15 MV/cm but most practical dielectrics fall into the rather narrow range from 4 to 10 MV/cm.

Thermal breakdown comes from failing to remove the heat generated by energy losses. If the heat has to escape through the electrodes there is a limit to the voltage which can be supported at a given frequency and temperature. The limit is high for d.c. but may be as low as 1 MV for a.c.

Discharges in holes or weak spots in the dielectric (Fig. 3), or over its surface, often cause breakdown. Their number depends on the number of cycles and on the total voltage swing so that the life of insulation is often a function of the number of cycles (Fig. 4).

With d.c. and low voltage a.c. breakdown often comes from electrochemical deterioration, in which may be included low voltage surface tracking.

(5) Long chain molecules can provide fibrous, flexible and tough materials. Low creep and rigidity comes with cross-linking. Plastics are essentially inhomogeneous: crystalline regions must be connected by amorphous regions.

Hydrocarbons are non-polar and can be highly purified. Polymerization can provide long chains and, by avoiding or minimizing plasticizers, anti-oxidants and the like, a low loss angle of 1 to 3 or 4×10^{-4} up to 10^{10} c/s can be achieved with poly-

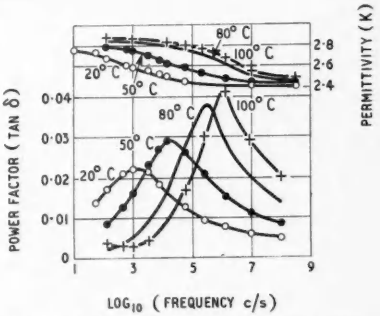


Fig. 5.—**Variation of power factor and permittivity of KelF with frequency at different temperatures. (Hartshorn and Rushton)**

thene and polystyrene, which do not soften until 100 deg C, but are liable to creep. Polythene can be processed like rubber and used for cables and insulators; polystyrene is harder and more limited. To increase the temperature range and mechanical strength the hydrogen in polythene can be replaced by fluorine to give P.T.F.E., which is hard up to 300 deg C. If one of the fluorine atoms is replaced by chlorine, as in P.C.T.F.E., the softening temperature is reduced by only 50 to 100 deg C, but the material is then easily processed and, according to crystallinity, can be transparent and flexible or translucent and rigid. Unfortunately the resulting asymmetry of the molecule greatly increases the loss angle (Fig. 5). Polystyrene can be stiffened and used at 120 deg C by forming a copolymer with acenaphthalene. Cross-linking, and hardening, can be achieved in polythene by neutron bombardment in an atomic pile; several materials are now being so explored.

The epoxy resins, such as Araldite, appear to be cross-linked and are strong

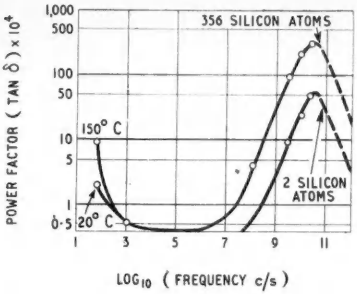


Fig. 6.—Loss angle of silicone fluids. (Hartshorn and Rushton)

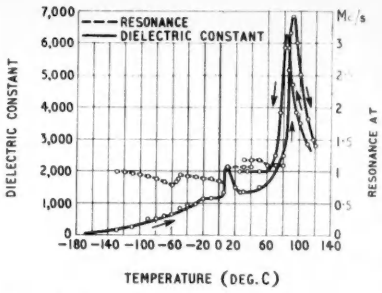


Fig. 7.—Properties of barium titanate. (von Hippel)

and highly adhesive but are limited to not much over 100 deg C and the asymmetry of the molecule gives a high loss angle.

The silicon-oxygen link in the silicones causes a high loss angle at very high frequencies (Fig. 6) without affecting the main useful range. The replacement of carbon by silicon gives a temperature range up to 200 deg C over which their remarkable mechanical properties are substantially constant.

Very few dielectrics fail to absorb moisture. Quartz, mica and glass are little affected. The oxygen linkage of silicones is hydrophobic. P.C.T.F.E. is unaffected by moisture and non-polar plastics, such as condensed hydrocarbons, are in general but slightly affected. The properties of polar materials are usually dominated by absorbed moisture. However, terylene and nylon fibres fortunately do not show macroscopic absorption as do paper and natural textiles. Since it is often difficult to use materials unaffected by moisture, great effort is devoted to sealing. Ordinary varnishes and sealing materials only slow down the ingress of moisture to secure a reasonable working life; great advances have now been made in hermetic sealing, of which the most widespread example is the high-voltage cable, depending usually on a metal container, but a variety of devices are used in electronic components for tropical use.

The success of varnish paper, which still provides half the bulk of insulation, rests partly on its use of the same principle as reinforced concrete. For reasons already given it is advantageous to replace the paper by glass, terylene and nylon. As binder, or impregnant, silicone or an epoxy or polyester resin (e.g., an isocyanate) or a nitrogenous resin, like melamine, can exploit the properties of high temperature, low losses and resistance to moisture, discharges and tracking. Nevertheless the cellulose molecule, including the acetylated and calcium-exchanged forms, holds its own in economy and convenience.

Rochelle salt, titanates and niobates form crystals in which the bonding is delicately poised between ionic and homopolar, so that the dipole moment of the unit cell readily changes. They are miscalled ferroelectrics, because they are analogous to ferromagnetics in showing a Curie point, a high polarizability over a certain temperature range (Fig. 7), saturation phenomena, hysteresis and large mechanical effects, i.e. electrostriction. Thus they will make small capacitors because of the high

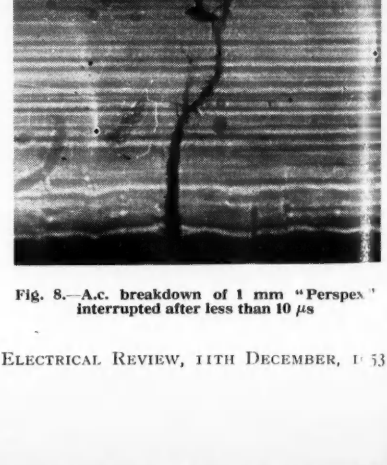


Fig. 8.—A.c. breakdown of 1 mm "Perspex" interrupted after less than 10 μs

permittivity, dielectric amplifiers and electromechanical transducers. They yield a domain structure. The so-called antiferroelectrics do not have resultant dipole moments at low temperatures and the permittivity is lower.

Internal discharges and, in some degree, external discharges begin a breakdown path by erosion due to local heating or by a thread-like or spiky decomposition (Fig. 8). Intrinsic breakdown can finally occur at the tip. At high frequencies or with extensive damage thermal instability may occur. Above a stress of 50 kV (crest)/cm it is desirable to prevent voids between sections of homogeneous insulation and particularly at conductor surfaces. Conducting and semi-conducting films are useful here. Some success has been achieved in impregnation with solventless varnish which does not change in volume when it sets. The greatest advance has been in the use of oils, compounds and gases under a pressure of, say, 10 atmos, by which the voids are both reduced and their electric strength increased some three times. Working stresses of 200 kV (crest)/cm have been reached and pressure-type cables have attained an impulse electric strength of 2 MV/cm (one-half the intrinsic electric strength). Gases such as freon and sulphur hexafluoride have a high electric strength at normal pressures but lose this advantage at high pressures. Air and common gases at 40 atmos pressure are emerging from the laboratory, e.g., in electrostatic generators.

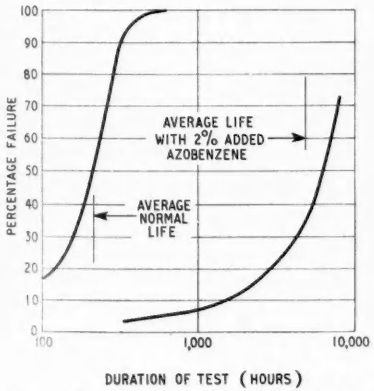


Fig. 9.—Effect of 2 per cent addition of a hydrogen accepting substance on the life of capacitors with a chlorinated impregnant. (Church and Garton)

Moisture is often responsible for the electrochemical deterioration mentioned earlier, but sometimes active gases are generated from the insulation. In some waxes and oils nascent hydrogen is so generated but can be absorbed harmlessly by substances known as stabilizers or inhibitors and the life greatly lengthened (Fig. 9).

A thin dielectric withstands a high electric field but, except with mica, single layers can rarely be used because of chance defects. There are now good synthetic films, but care is needed, as in the recent case of a film plasticized by human grease in the dandruff from operators' heads, before protective measures were instituted. Aluminium oxide offers promise for very thin films.

Although this article, which is based upon a lecture delivered at the recent meeting of the British Association, has sought to show the contribution made by fundamental, including theoretical, science, yet the results must be incorporated in engineering designs. Accordingly only the fullest co-operation can make successful in practice the introduction of new scientific concepts.

Fluid Couplings

IN a paper to the Manchester Association of Engineers on 27th November, Mr. E. C. Farrer discussed the service characteristics of the two basic types of Vulcan-Sinclair fluid coupling, viz. the traction and the scoop-control, as applied to electric-motor and diesel-engine drives.

The traction type he described as a simple two-element coupling with a driving impeller and a driven runner, the oil filling being constant with the coupling in rotation. For the scoop-control type, the elements were similar, but oil could be introduced or withdrawn as required. Examples of applications included one of the traction coupling to a 30 h.p. squirrel cage motor driving a textile spinning frame, having a high inertia at starting, and another of the scoop-control coupling to a 160-spindle 15 h.p. wool ring spinning frame with a three-to-one speed variation.

Scoop control had, perhaps, its widest field in boiler-house fan control, 5,000 couplings being in service at power stations of the B.E.A. and abroad with infinitely variable speed regulation of direct-on started s.c. motors over a range of five to one, thus permitting operation at the lowest minimum fan speed required by the draught conditions.

JET ENGINE TESTING

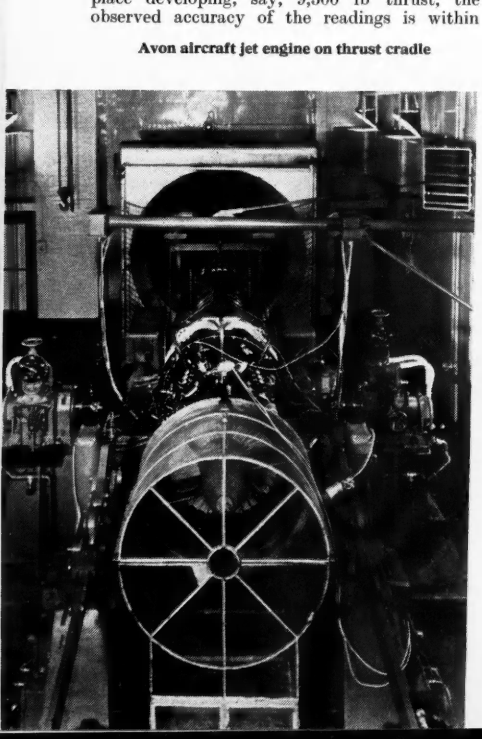
Installation at New Scottish Factory

THE main contractors for the jet engine test plant built for the new Rolls-Royce aero engine factory at East Kilbride, Scotland, were Heenan & Froude, Ltd. The principal components of each test bed of this plant are the thrust cradle for measuring the thrust exerted by the engine on test, the main control panel and the fuel cubicle. The cradle, which is capable of dealing with larger and more powerful engines than the present Avons, consists of a steel framework suspended on thin, wide steel strips, permitting great freedom of movement in an axial direction. This framework is linked on both sides to a very stiff torsion shaft, so that any tendency to "yaw" because of offset or cranked jet pipes is eliminated. Motion of the cradle due to engine thrust is communicated to the control room by levers and pull rods (the latter suspended on steel strips instead of sliding in bearings) and a twist shaft which is arranged so as to reduce the forces in the ratio of 75 : 1. The resulting force is measured by an Avery pendulum weigher of great accuracy. Checking gear consists of two separate sets of levers and dead weights by which known thrusts can be applied to each side of the cradle. This system has proved most convenient, and the accuracy obtained is of a high order. With an engine in place developing, say, 9,500 lb thrust, the observed accuracy of the readings is within plus or minus 5 lb, equivalent to about plus or minus one-twentieth of one per cent. Two small Froude dynamometers, one each side of the cradle, provide means for testing the engine auxiliary take-off drive, the water they use being continuously recirculated through a Heenan water cooler.

The test beds have been built on the lines of a continuous control corridor, from one side of which engine test cells project at right angles, individual control panels with observation windows being set in the corridor wall opposite each plant. Each control panel is built to give a good view of the engine and is provided with two engine control levers and a wide range of instruments. The main storage tanks, each of 12,000 gal capacity, are sunk in a pit outside the test house. Fuel is pumped to a "fuel cubicle" at each plant.

Generally the electrical equipment includes main distribution boards and fuseboards; 24 V and 96 V batteries, with rectifiers and relay panels for charging; Rotax starter panels; high-energy units for torch igniters; solenoid valves, ignition relays, time switches, desk panels, warning lights and Klaxons, and booster coils; and relay and indicator panels, and remote push-button stations.

Avon aircraft jet engine on thrust cradle



Domestic Heat Pumps

MORE than 1,000 heat pumps, about half of them for household use, are now installed in the United States. The prospect of further rapid development, it is stated in the *Financial Times*, is shown by the introduction in August by the Westinghouse Electric Corporation of standard 2 and 3 h.p. pumps as well as by the General Electric Co. (Inc.), which started flow production of 3 and 5 h.p. units towards the end of last year. Prices are given as $3,800 and $4,800 for the G.E.C. machines and $2,300 for the Westinghouse 2 h.p. unit, which are from $500 to $1,000 more than the cost of alternative separate heating and cooling equipment.

Since the ratio of five to one between the heat energy thus made available and that of the electricity required for operating the plant varies with atmospheric conditions, the greatest scope is provided in districts, such as Florida and California, where seasonal differences in temperature are relatively small. Supply undertakings are interested in the high load factors obtainable from the heat pump as a means of cooling in summer in addition to warming in winter and consider that at 2 cents per kWh it would become competitive with other methods.

Transatlantic Telephone Cable

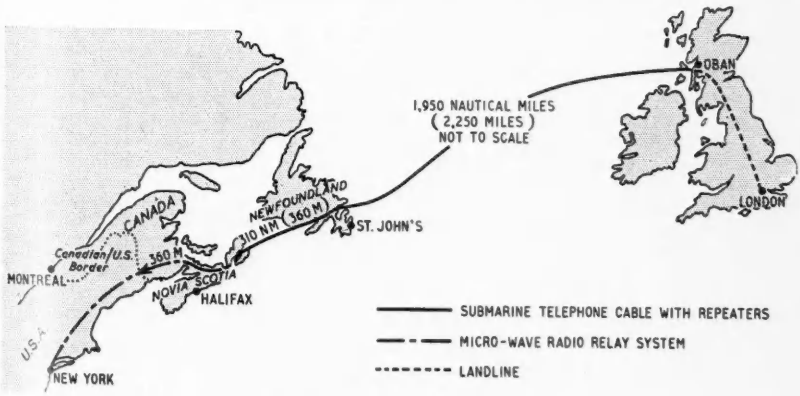
First Long-Distance Link of its Kind

THE first successful transatlantic telegraph cable was brought into service in 1866. To-day, not only the Atlantic but all the oceans are crossed by many telegraph cables which link together the continents. These cables, however, are incapable of transmitting speech, the longest submarine telephone cable now in service being less than 200 miles. Overseas telephone facilities for longer distances are provided by radio and are subject to the uncertainty attached to all long-distance radio transmissions.

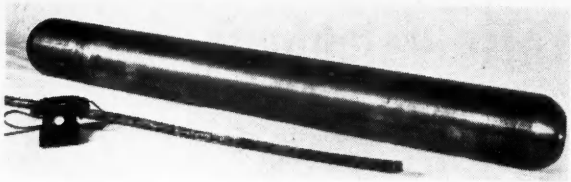
The decision to lay a transatlantic telephone cable (reported in our last issue) has been made possible by the development of reliable submerged repeaters. In a long story of research and development first place must be given to the work of the Bell Telephone Laboratories, as the American design of repeater will be used on the main crossing between Newfoundland and Scotland (1,950 nautical miles). American experiments with deep-sea submarine cable suitable for telephony date back to 1920, although it was not until 1932 that it appeared that submerged repeaters might eventually become a practical possibility.

Cable laying trials, carried out in the deep water of the Bay of Biscay in 1930 under the direction of Dr. O. E. Buckley, had already led to the decision that these repeaters should be made as much like the cable in diameter and flexibility as possible so that laying could take place without stopping the cable ship. A repeater housing was eventually developed of only 2in outside diameter and about 7ft long. The housing comprised a thin walled copper tube supported internally by abutting steel rings capable of withstanding sea pressure up to 5 tons/sq in. At each end of the housing a series of three watertight seals tapered down to the cable diameter. The whole 20ft long assembly ran smoothly around the drums and sheaves of modern cable ships.

Development of a housing met, however, only part of the requirement. Long-life valves and other electrical components had to be developed to ensure trouble-free service for a period of some twenty years.



Sketch map showing the route of the new transatlantic telephone cable system



British Post Office type of rigid deep-sea repeater which will be connected into a section of the submarine coaxial cable (shown in foreground) at intervals of 25 nautical miles to provide thirty-six telephone circuits

All this was done, and repeater and cable designs had been completed in 1940 when the war stopped active work. Afterwards, the design was reviewed and in 1950 two "repeatered" cables were manufactured and installed between Havana and Key West (about 120 nautical miles) at a maximum depth of about one mile. These cables each contain three one-way repeaters and the system has given fault-free operation.

British development started in the Post Office Research Laboratories in 1938 but initially had regard to the economic desirability of developing submerged repeaters suitable for inclusion in the many telephone cables in operation between the United Kingdom and Europe as a means of increasing their traffic capacity. The first repeater to be used anywhere in a working cable was designed and constructed in these laboratories and brought into service in 1943.

Subsequent developments had as an objective repeaters which, spaced at intervals of 16 to 18 nautical miles, would allow most cables in European Continental waters to provide sixty circuits. So far, nineteen of these repeaters have been installed and have a satisfactory record of service up to seven years. More are being constructed. They are in large rigid housings and are both too cumbersome and weak for use in deep water. A smaller rigid housing has, however, been developed and British-made repeaters to be used for the section of the transatlantic route between Newfoundland and Nova Scotia (310 nautical miles) will probably be in the smaller housings.

A both-way submarine telephone circuit can be provided by two methods. One method requires two cables, one for each direction of transmission; the other divides the total frequency band transmitted by a single cable into two parts and uses one part for each direction of transmission. The second method does, however, require that at each repeater there should be directional filters. The American system uses the first method and the electrical circuit of the repeaters is therefore of the simplest possible form. The Post Office system is of the second kind, British practice in home waters having been based on the use of a single cable for both directions of transmission.

The detailed design of the system has not yet been completed by the British and American engineers but it is envisaged that there will be two one-way cables between Scotland and Newfoundland and a single two-way cable between Newfoundland and Nova Scotia. The system will provide about thirty-six high quality telephone circuits any one of which could technically be used to provide a number of telegraph circuits. There will be about fifty repeaters in each of the cables on the main crossing and thirteen in the shorter cable. Each repeater will consist essentially of a three-stage feedback amplifier using long-life valves, so that there will be between 300 and 400 valves installed under the ocean, together with nearly 10,000 other electrical components. The success of the system depends on very few of these developing faults during the next 20 years or more.

The repeaters will be d.c. operated over the central conductor of each cable from the terminal stations; this will necessitate there being about 2,000 V between the central conductor and the sea at the ends of the long sections. The design of the terminal power plant will give unusual emphasis to current regulation, continuity of service and protection against surges.

As in the case of the more modern submarine telephone cables, the transatlantic cables will be of the coaxial type. They will be 0·62in diameter at the outer conductor and the deepsea sections will be about 1·5in diameter over the high tensile steel armouring wires. High molecular weight polythene will be used as the cable insulant. Polythene, which is used for a number of modern cables, has several important advantages over paragutta and the older insulants. The cable will have to be manufactured to a much higher degree

of precision than heretofore required, especially for use on the long route between Newfoundland and Scotland where even small irregularities in electrical characteristics will upset the fine balance that must be maintained between repeater gain and cable loss. Although a great part of the cable will be made in the United Kingdom, manufacturing will be divided between the United Kingdom and the United States where cable meeting somewhat similar requirements was made for the Havana–Key West installation.

The cables will be laid by the Post Office Cable Ship *Monarch*. This ship has a gross tonnage of 8,056 and can carry between five and six thousand tons of cable. It is the largest cable ship afloat and has already undertaken many important cable laying jobs in various parts of the world. The cable laying equipment on the ship will be modified and adapted to enable cable and repeaters to be laid as a continuous operation. The project is expected to cost about £12½ million and to take about three years to complete.

Protective and Auxiliary Relays

AN extensive development programme carried out by the English Electric Co., Ltd., has resulted in the introduction of a range of protective and auxiliary relays that incorporate many features not hitherto found in protective devices. The relays are available in fixed projecting cases and also " drawout " cases, which enable them to be quickly withdrawn for inspection and maintenance. Withdrawal can be made during service since removal automatically opens the trip circuit and short circuits the current transformers so that external devices remain unaffected.

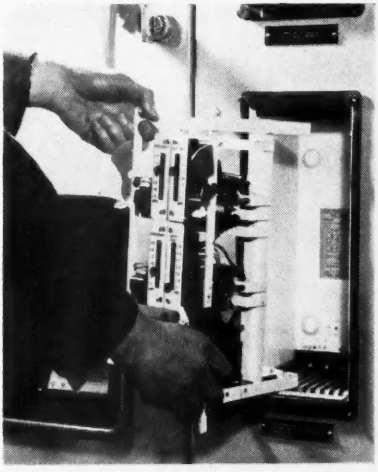
A test plug, which reduces the time taken for routine tests, is available for drawout relays and is inserted from the front. To avoid altering links or connections at the front or back of the panel, the wiring is standardized to allow the test plug to be moved from relay to relay without changing the test plug connection. It is possible to test relays in a sixth of the time that it previously took, and without the aid of a connection diagram. A universal test block is available to enable the test plug to be used with existing non-drawout relays, thus giving them the same easy testing facilities as the drawout types.

The relays are of standardized construction, there being only two basic movements. These are the induction disc relay for use generally where adjustable time characteristics are required, and the induction cup relay, which is recommended where " instantaneous " operation is required with times of approximately 0·01 sec together with accuracy of the order of 2 per cent including the effect of transients. These two units can be made to produce any relay characteristic (differential, distance, directional, etc.) simply by varying windings and making minor variations on the basic design. Thus, familiarity on the part of maintenance engineers with the basic designs will give overall understanding of the whole range. It also facilitates the ordering and stocking of spare parts.

The induction principle is used in both movements because of its accuracy, high reset value, steady vibrationless torque and insensitivity to transients. No rectifiers are required and the construction and circuits are simple.

In addition to these basic units, a standard hinged-armature relay of improved design is available. This is used in various auxiliary devices such as check alarms, intertripping relays, semaphores and flag indicators. It can also be adapted to overcurrent, overvoltage, undervoltage and earth fault protective schemes where instantaneous operation is required without great accuracy. Finally there is a Buchholz relay of improved design, and a precision timing relay which can be used on a.c. or d.c. with continuous rating, providing time ranges from 0·01–1 sec up to 10–120 sec.

English Electric protective relay withdrawn from its case. The drawout contact fingers can be seen in the bottom of the case



CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Selling Electric Cookers

IT is grieving to read that Mr. Paget has found cooking by electricity more expensive than by gas. May I advise him that when cooking by electricity one does not require one boiling plate per saucepan. One boiling plate will keep two or three pans simmering simultaneously. A meal for six people can be cooked easily on the grill-boiler: three or four saucepans on the top and meat or fish grilling below, at a cost of one unit.

For further practical information I should recommend to Mr. Paget "The Electric Cookery Book" which is distributed by the Electrical Development Association and is on sale in all Service Centres.

In view of the fact that some millions of women are happily using electric cookers, it is possible that Mr. Paget is underestimating the average intelligence of the housewife when he states that "women require extensive tuition in how to use an electric cooker."

*London, E.C.*1. ESTER PURVIS.

Absorption and Compressor Refrigerators

I HAVE only just read Mr. E. G. Batt's letter in your issue of 13th November and I hasten to contradict his statement that "sealed compressor type equipments are so silent as not to cause any annoyance to their users." I can introduce him to several non-technical friends who will be only too willing to complain to him even more volubly than they do to me.

My own 3 cu ft refrigerator, made by one of the most respected members of Mr. Batt's Association, has always made an undue amount of noise; this is so loud that, should the kitchen door in my bungalow be inadvertently left open at night, I am awakened and forced to get up to close the door. This matter was taken up with the local agent, through whom I bought the appliance, but no satisfaction of any kind was obtained.

I would also mention two other interrelated points: frequency of operation of the thermostat and radio and television interference. My particular machine is described as being free from interference with radio; this, of course, is only true when running, as the interference when the motor is switched on by the thermostat is most objectionable on both radio and television. Again I have taken this up with the makers without any satisfaction and I feel that the public is being misled by the claim of freedom from interference referring only to the operating condition.

It has always seemed to me that domestic refrigerators switch on and off at much too frequent intervals, although I have no data on fluctuation of internal temperatures on which to base this opinion. If the differential of the thermostat could be increased the annoyance caused by the radio interference at starting would be reduced proportionately. This, of course, assumes that the makers continue to be unwilling to fit the necessary suppression to their machines. W. H. DEVENISH, A.M.I.E.E.

Ewell, Surrey.

Boards as Contractors

IN your issue of 27th November you give the news of the Midlands Electricity Board's loss of £83,433 for 1952 on the sale of electrical fittings. I think this is ample proof that it is high time the Electricity Boards were compelled to close down all those departments not directly connected with the production and sale of electricity.

The sale of fittings and all wiring work in consumers' premises should be divorced from the B.E.A. and all its Boards as a matter of common sense and in fairness to the contracting industry and retail enterprise. Surely the main business of a supply authority is to provide as much electricity as is required at the lowest possible price and not interfere with contractors' and retailers' jobs. PRIVATE ENTERPRISE.

Water Softening

IF any readers have had practical experience of domestic water softening by both chemical and electrical apparatus, I would be very grateful to have their views on the two methods. "E.H."

VIEWS on the NEWS

By REFLECTOR

ELECTRICIANS employed by the Electricity Boards are reported to have another grievance. When sent out to execute repairs, etc., they have to go in vans instead of walking or cycling to the job. They contend that in consequence of this they should receive a weekly driving allowance. Because the Boards do not agree the men are said to be refusing to travel in vans, preferring to use their cycles. Robert Louis Stevenson considered that to travel (hopefully) was a better thing than to arrive but I am not sure that this applies to electricians on urgent jobs.

* * *

Interference with television reception has been experienced since the Morecambe–Heysham line began operation on the 6·6 kV 50 c/s a.c. system. As one result British Railways have agreed to substitute steam locomotives for the electric trains at times of slack traffic. I consider it an ominous sign of the times that what is, after all, mainly entertainment is thought to be of such importance as to warrant interference with a development in electric traction which is calculated to result in considerable economies.

* * *

A letter to the Southern Sub-Area of the London Electricity Board (reproduced in *London Electricity*) is a complaint from a firm of organ builders of the behaviour of mechanics attending to electric blowers. The writer says that recently two organs suffered severely as a result of workmen climbing about the interiors. They were apparently church organs, for the letter says:

> "In one case considerable distress was caused by the fact that one man was actually found smoking in the organ, which, apart from being irreverent, was most dangerous."

The Editor of *London Electricity* confesses to "some slight surprise that there are such things as electric organ blowers—except in cinemas." I do not share his surprise at this but I do wonder why it is necessary to wander about an organ's interior to attend to a blower.

* * *

"Smog" is a horrible word but one that aptly combines smoke and fog and suggests the foul nature of this combination. With most others, I suppose, I had an idea that the word was of fairly recent birth, but Mr. Arnold Marsh, general secretary of the National Smoke Abatement Society, says in a letter to *The Times* that "smog" was introduced as long ago as 1903 by Dr. Des Vœux, a London physician, who was the first president of the National Smoke Abatement Society.

* * *

Apropos my note on the overheating of London's Underground tunnels a fortnight ago, a Macclesfield correspondent suggests that the nation cannot afford to throw away all this hot air. (Parenthetically, I might question whether the nation is not already subjected to too much "hot air.") His proposal is that the air could be used to warm some of London's large buildings, directly or through a heat pump. The drawback, of course, is the fact that what we are dealing with is an accumulation of heat—not a regular supply of any magnitude.

* * *

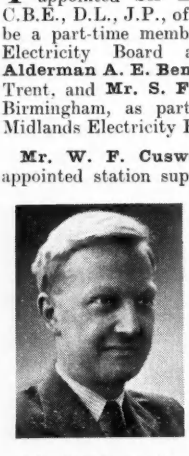
The *Manchester Guardian* has unearthed an early example (1868) of traffic control. This comprised a 20ft high column near the Houses of Parliament upon which was mounted a gas lamp and semaphore arms. The arms, in railway fashion, contained green and red glasses which alternately covered the lamp. Unfortunately the gas lighting proved unsatisfactory and, it is said, there was an explosion which injured the constable operating the signals. Over half a century elapsed before electrically-operated signals were introduced—at Leeds in 1923.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Minister of Fuel and Power has appointed **Sir Leighton Seager,** Bt., C.B.E., D.L., J.P., of St. Mellons, Cardiff, to be a part-time member of the South Wales Electricity Board and has re-appointed **Alderman A. E. Bennett,** J.P., of Stoke-on-Trent, and **Mr. S. F. Burman,** M.B.E., of Birmingham, as part-time members of the Midlands Electricity Board.

Mr. W. F. Cusworth, B.Sc., has been appointed station superintendent at Dunston "A" and "B" and Blaydon power stations, North Eastern Division, B.E.A., to take effect as from 1st February next. Mr. Cusworth was educated at Heaton Secondary School, Newcastle-upon-Tyne and Durham University. He served in the Royal Navy during the last war as a lieutenant (E), after which he joined the staff of the North Eastern Electric Supply Co. as an assistant engineer. Before vesting day he held positions in the Generation (Operation) Department and in 1951 was appointed deputy superintendent at Dunston "A" and "B" and Blaydon power stations. Mr. Cusworth will succeed **Mr. J. Downie,** who retires on 31st January.



Mr. W. F. Cusworth

The American Institute of Electrical Engineers has invited **Mr. L. Greenwood,** M.I.E.E., M.I.Mech.E., chief electrical designer in the Machine Department of the Chelmsford works of Crompton Parkinson, Ltd., to become a Fellow of the Institute. The citation with the award says that it is "for contributions in the field of alternating current and direct current machine design, exemplified both by actual practice as well as by authorship of technical literature." Mr. Greenwood has been with Crompton Parkinson, Ltd., since 1946.

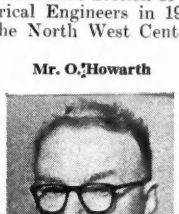
Mr. P. E. M. Sharp, A.C.G.I., B.Sc.(Eng.), A.M.I.E.E., has left the Telegraph Construction & Maintenance Co., Ltd., to join the China Engineers, Ltd., their agents in the Far East. Before leaving, visits are being made to other concerns in the electrical industry for whom China Engineers are agents. Mr. Sharp will be visiting Australia in April next on behalf of the Telegraph Construction & Maintenance Co., Ltd., and its associated company A.W.A. Telcon. Mr. Sharp will be resident for the time being in Kuala Lumpur, Malaya.

Mr. H. G. Bell, M.Sc.(Tech.), M.I.E.E., manager of the North Western Electricity Board's No. 1 Sub-Area and former chief engineer and manager of the Stretford electricity supply authority, is to succeed **Mr. O. Howarth,** M.I.E.E., M.Amer.I.E.E., as chief engineer to the Board. Mr. Howarth is retiring in February.

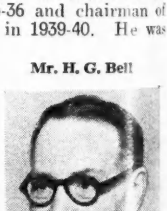
Before nationalization Mr. Howarth was chief technical engineer and sales manager of the Lancashire Electric Power Co. He was the first officer to be appointed by the Board, and one of his first tasks was to integrate the distribution systems of the seventy-six electricity undertakings in the Area. He obtained his early training with the General Electric Co., Ltd., and Ferranti, Ltd., later joining the Manchester Corporation Electricity Department (in 1909) as an engineer in the Testing Department. In 1919 he took up a position with the Lancashire Electric Power Co., in charge of meters and testing and was subsequently promoted to the joint position of chief technical engineer and sales manager.

Mr. Howarth was chairman of the Meter and Instrument Section of the Institution of Electrical Engineers in 1935-36 and chairman of the North West Centre in 1939-40. He was

Mr. O. Howarth



Mr. H. G. Bell



an original member of the Electrical Power Engineers' Association and was treasurer of the Manchester Section and secretary of the local Technical Group when it was formed. He has read papers before the I.E.E. on meters, protection, and the control of voltage and power factor on interconnected systems. In the early days of the industry he made a valuable contribution to raising the standard of service and improving the prospects of the young electrical engineer.

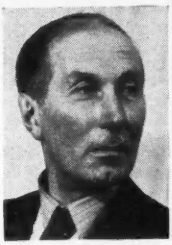
Mr. Bell was educated at Manchester Central High School, Manchester College of Technology, and Manchester University. He served as an infantry officer during the 1914-18 war. Following infantry service he was seconded to the Admiralty for submarine research work. In 1919 he joined the Metropolitan-Vickers and Westinghouse Companies, his various positions including that of liaison officer in America. While still with the Metropolitan-Vickers Co., in 1922, he ran the first B.B.C. North Western transmitter "2ZY" which then operated from Trafford Park.

He joined the Central Electricity Board in 1930 as chief technical engineer for the North West, leaving in 1946 to become chief engineer and manager at Stretford.

Mr. J. R. Harding, B.Sc.(Eng.), M.I.E.E., has been appointed assistant general manager of Pirelli-General Cable Works, Ltd. He was educated at the Crypt Grammar School, Gloucester, and University College, London, and was a college apprentice at the Trafford Park Works of the Metropolitan Vickers Electrical Co., Ltd., from 1922-24. He joined the Pirelli-General Cable Works in 1925 and has been successively a district engineer, manager of the Overhead Lines Department, deputy sales manager for rubber cable and joint sales manager for paper cable with Mr. R. J. Willoughby. He is a past chairman of the Hampshire Sub-Centre (now the Southern Centre) of the Institution of Electrical Engineers.

Mr. J. R. Harding

With effect from 1st December **Mr. W. A. Shaw,** A.M.I.E.E., has been appointed sales director and elected a member of the board of Evershed & Vignoles, Ltd. Mr. Shaw, who succeeded Mr. F. C. Knowles in the position of general sales manager in 1949, was born in London and educated at Bacon's School. Later he studied electrical engineering at the Borough Polytechnic Institute under the late Dr. Henderson. In 1913 he joined the test room staff of Evershed & Vignoles, Ltd., and



Mr. W. A. Shaw

Mr. H. W. Griffiths

was for several years engaged in development and experimental work on a wide range of instruments. He transferred to the commercial side in 1919 as a technical assistant and in this sphere he has had a wide experience in the application of the company's products.

Mr. H. W. Griffiths, A.M.I.E.E., M.S.M.A., M.I.Ex., has been appointed general sales manager in succession to Mr. Shaw. Mr. Griffiths was educated at Battersea Polytechnic, and received his early electrical training with the Westminster Electric Supply Corporation and Central London Electricity, Ltd. In 1939 he was assistant works engineer with Central London Electrical Accessories, Ltd. From 1939 to 1945 he served in the R.A.O.C./R.E.M.E., attaining the rank of major. He was appointed works engineer to Central London Electrical Accessories, Ltd., in 1946, but after a short period left to become the export sales engineer with Evershed & Vignoles. He was appointed export sales manager in 1948.

Downes & Davies, Ltd., announce the appointment of **Mr. R. H. Dickson** as manager of their Manchester Branch. Mr. Dickson was formerly with the Shropshire, Worcestershire & Staffordshire Electric Power Co., joining the army at the outbreak of war, when he was on active service in the Far East, retiring with the rank of lt.-colonel. Since that time he has been with Monmore Conduits, Ltd., and Ductile Steel, Ltd., as their northern area sales manager. Mr. Dickson takes up his new duties in January.

Mr. R. H. Dickson

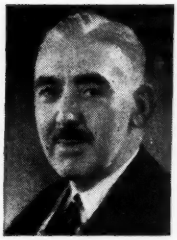
Mr. H. Williams, M.B.E., T.D., A.M.I.E.E., has been appointed manager of the Worcester Branch of British Insulated Callender's Cables, Ltd., in succession to the late Mr. C. H. Panting. Mr. Williams, who

completed his education at the Swansea Technical College, joined the former British Insulated Cables, Ltd., in 1932 as a sales engineer at Swansea, later transferring to the Cardiff office. In 1938 he joined Electrical Components, Ltd., as manager of its Swansea Branch. He held a commission in the Territorial Army and was consequently mobilized on the outbreak of war. During his seven years in the army he served mainly overseas as a staff officer on the S. and T. Directorate. Mr. Williams was released with the rank of lt.-colonel in 1946, when he rejoined B.I.C.C. as sales engineer for the South-West area and operated from the Bristol Branch office.

On 1st December the **LESSA Music Society** (London Electricity Sports and Social Association) gave another very enjoyable "Music For You" choral and orchestral concert at the St. Pancras Town Hall. The programme was well-arranged and popular. Under their able conductor Mr. Leslie Atkins, the orchestra gave a creditable rendering of Mozart's Symphony No. 40 in G minor, whilst their "Danse Macabre" (Saint-Saëns) was truly "ghostly." The choir with their chorus master, Mr. Douglas Sharpe, sang a selection of carols and part songs and joined the orchestra in "Tales from the Vienna Woods" (Strauss) and an excerpt from Rimsky-Korsakov's "Christmas Night." The soloist in Litolff's "Scherzo Concerto" was Mr. Arthur J. Whitehead, who gave a most spirited performance.

Four hundred and fifty persons, including the Mayor of Blackpool, attended the annual dinner of the Fylde branch of the **Electrical Contractors' Association,** held at the Norbreck Hydro, Blackpool, on 3rd December. Alderman Sir Herbert Barber (Southport), proposing the toast to the Association, said its members were responsible for 90 per cent of the private installation work carried out in Britain. Its membership found employment for 100,000 people. A lot had been heard about pollution of the atmosphere by smoke. The remedy was a great extension of the use of electricity for both industrial and household purposes. Mr. W. T. Trace, past president of the E.C.A., responded.

Mr. H. Esther, B.Eng., M.I.E.E., formerly head of the operation and maintenance section of the North Eastern Electricity Board, has been appointed chief engineer of the Board in succession to **Mr. T. M. Ayres,** who, as we have already reported, has become deputy chairman of the Board.



Mr. H. Esther

Mr. Esther was educated at Waterloo-with-Seaforth School and received his engineering training at Liverpool University. He joined the North-Eastern Electric Supply Co. as a student engineer in 1923, and after holding various positions with the company, he was appointed engineer, Operations Department (Transmission and Distribution) in 1947, a position he held until his appointment to the N.E.E.B. He is chairman of the North-Eastern Centre of the Institution of Electrical Engineers.

The annual dinner and ball of the Northern Counties Area of the **Electrical Industries Benevolent Association** was held at the Old Assembly Rooms, Newcastle-on-Tyne, when Mr. W. R. Gledson, area chairman, and Mrs. Gledson received 300 guests. They were supported by Mr. J. C. Mitchell, chairman-elect, and his daughter-in-law, Mrs. J. W. W. Mitchell. At the dinner Mr. W. R. Gledson proposed the toast of the Association, and during the evening the Monkhouse Rose Bowl the Northern Counties Area golf trophy, was presented by Mrs. T. L. Dellow to the winner, Mr. H. A. Dixon.

Mrs. W. R. Gledson (left) receiving a bouquet from Mrs. J. W. W. Mitchell at the E.I.B.A. Northern Counties Area annual ball. With them (left to right) are Mr. W. R. Gledson, Mr. J. W. W. Mitchell and Mr. J. C. Mitchell

In our last issue we reported a farewell luncheon given to **Dr. C. C. Garrard** on his retirement from the board of the General Electric Co., Ltd. In the accompanying picture we show Sir Harry Railing (chairman and joint managing director) presenting Dr. Garrard with a silver rose bowl. As stated

Dr. C. C. Garrard receiving a silver rose bowl from Sir Harry Railing on his retirement from the board of the G.E.C. Seated on Dr. Garrard's right is Mr. W. H. Williams (director)

in our previous notice, Dr. Garrard's services are being retained in a consultative capacity.

Mr. W. W. Robinson, agricultural development engineer, North Western Electricity Board, has been appointed agricultural assistant in the Commercial Department of the Western Sub-Area, Tenby, of the South Wales Electricity Board.

The annual apprentice prize-giving of **Hoover, Ltd.,** was held on 26th November at Perivale, Greenford, Middx. Following tea, an inspection of displays of various aspects of the Hoover apprentice training scheme, and of the training school, the prizes were presented by Mr. G. H. G. Dyson, chief national coach of the Amateur Athletic Association, who also addressed the apprentices. The presentation ceremony was opened by Mr. B. H. Dyson, director and general works manager, and Mr. L. Taylor, a fourth year apprentice, presided. The evening was concluded with the one-act play, " The Anniversary," by Tchekov.

The third annual dinner-dance of the **Exeter Electric Club** was held at the Imperial Hotel, Exeter, on 20th November. The principal guest of the evening was Mr. H. D. Parsons, an associate director of Enfield Cables, Ltd., who proposed the toast of the Club. Mr. E. J. Allen, the president of the Club, responded. The toast of the visitors was proposed by Mr. G. S. Mogridge, vice-president, and Mr. I. M. Robertson, chairman of the Bristol Electric Club, responded.

The first post-war ladies' night of the **Association of Supervising Electrical Engineers,** held on Saturday last, proved a popular function, and over 250 members and their ladies sat down to dinner at the Trocadero, London, under the chairmanship of Mr. J. Flood, Associate I.E.E. Mr. C. T. Melling (the president of the Association) and Mrs. Melling attended.

Following the loyal toast, the only other toast of the evening was to the ladies, which was proposed by Mr. Flood, who refrained from speaking of things electrical, emphasizing that it was the ladies' night. He expressed the members' pleasure at their presence and thanked the Committee responsible for organizing the function for the excellent arrangements made.

Mrs. Melling showed that the ladies are not averse to a little electrical propaganda even on social occasions, and in responding to the toast spoke of the blessings which electricity had brought to the home, from which we gathered that not the least is the fact that it sometimes attracts the men to the kitchen! Following the dinner, Mr. P. A. Thorogood received a wrist watch as a token of the Association's appreciation of his work in connection with the Electrical Engineers' Exhibition. This was followed by dancing and an excellent entertainment by Barrie Manning and his " Champagne " cabaret.

A high percentage of " passes " (84 out of 117) was reported at the annual presentation of prizes to employee students of the Anchor Works (Leigh, Lancs.) of **British Insulated Callender's Cables, Ltd.,** who have attended courses of local municipal technical colleges during the past year under the company's further education scheme. The awards were presented by Mr. F. Waine, B.I.C.C. director.

Their sixty-fifth anniversary celebration dinner and dance was organized by **T. Clarke & Co., Ltd.,** at Grosvenor House, London, W.1, on Monday last. About 300 people were present including many leading representatives of the electrical profession and industry. After dinner the toast of " The Company " was proposed by the Earl of Verulam and the response was by Mr. A. J. Shrosbery, the deputy chairman and managing director. Sir Harold Moore, the chairman, who presided at the dinner, proposed the health of the guests and Sir Alexander H. Maxwell, K.C.M.G., responded. The guests received copies of a handsome illustrated brochure dealing with the company's history and activities.

OBITUARY

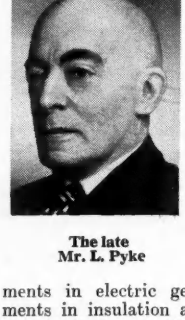
Mr. William James Markham, who died in Birmingham on 4th December at the age of seventy-nine, was with Berry's Electric, Ltd., at Hall Green, Birmingham, for forty years.

He managed the works and became a director, retiring in 1944, but acted for the company in an advisory capacity for several years longer. Mr. Markham achieved some distinction as an inventor, chiefly of domestic appliances and switchgear.

Mr. W. F. C. Skewes.—The death has taken place at the age of fifty-four of Mr. W. F. C. Skewes, founder and chairman of W. Skewes & Co., Ltd., electrical engineers, Doncaster.

Mr. Thomas Lockett, O.B.E., commercial officer of the North Staffordshire Sub-Area of the Midlands Electricity Board, died suddenly on 2nd December at the age of sixty. Mr. Lockett was in local government service before nationalization of electricity supply. He entered the service of the Stoke-on-Trent Corporation in 1911, and before the 1914-18 war was in the Hanley office of the Borough Treasurer's Department. After war service, during which he attained the rank of captain, he rejoined the Borough Treasurer's Department, and in 1926 was appointed commercial assistant to the city electrical engineer, the late Mr. C. H. Yeaman. In 1940 he was appointed manager (in charge of the commercial side of the undertaking), with Mr. H. L. Mills as engineer, and on the retirement of Mr. Mills he became general manager of the electricity undertaking which position he held until vesting date, when he was appointed commercial officer of the Midlands Board's North Staffordshire Sub-Area.

Mr. Leslie Pyke, of Lucas & Pyke, consulting engineers, London, died recently at the age of eighty-five. He had been working at his office until a few days before his death. Mr. Pyke was educated at University College School, and on leaving he devoted his time to the study of engineering and specialized in electrical work. In 1888 he formed a partnership with a Mr. Barnett for the purpose of developing patents granted to them for "Improvements in electric generators"; "Improvements in insulation and cooling of electrical inductoria" and "Electrical excitation of vacuum tubes, or other electrical discharge paths." Mr. Pyke joined forces with a Mr. Harris in 1891 and two years later they formed a company for the development of patents granted to them, which included "Improvements in the field magnets of dynamo electric machines" and "Improvements connected with electrical transformers and induction apparatus." During the years of this partnership (1892-1897) Mr. Pyke exhibited high voltage electrical apparatus and other equipment at the Royal Society's Conversazi[illegible]nes.



The late Mr. L. Pyke

In 1898 the firm of Lucas & Pyke, consulting engineers, was founded. The firm was a pioneer of theatre and country house lighting. With the extension of mains supplies throughout the country its activities expanded, and they now embrace the broader fields of commercial, industrial and institutional buildings.

Mr. Pyke was elected a Fellow of the Chemical Society in 1886, an associate member of the Institution of Electrical Engineers in 1891, and a full member of the Institution in 1892. He became an associate member of the Institution of Civil Engineers in 1893, and in 1913 a member of the Association of Consulting Engineers.

Mr. H. Ledward.—The death occurred on 3rd December, at the age of sixty-nine, of Mr. Hugh Ledward, a director of Britannia Electric Lamp Works, Ltd. Mr. Ledward was educated at Finsbury Technical College and at the Technische Hochschule, Karlsruhe, and received his training with Dick Kerr & Co. In 1908 he was in charge of contracts for the electrification of the Moscow Tramways and in 1912 became manager of the traction department of the Russian Dynamo Co., Moscow. From 1914 to 1918 he acted as agent for British electrical manufacturers in Russia. He was vice-consul in Siberia, and member of the first British Trade Delegation to Russia, and served in the Northern Department of the Foreign Office (1918-25). In 1925 he was appointed manager of the Export Department of the Edison Swan Electric Co., Ltd., and from 1928 to 1951 was associated with the British Thomson-Houston Co., Ltd. In 1945-46 his services were lent to H.M. Government as Director-General of the Electrical Branch of the Control Commission for Germany.

PRICES OF MATERIALS

IN the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £150 0s 0d
COPPER, H.C. Electro	ton £233 10s 0d
Fire Refined 99·70 per cent ..	ton £232 0s 0d
Fire Refined 99·50 per cent ..	ton £231 0s 0d
COPPER Tubes	lb 2s 2½d
Sheet	ton £290 0s 0d
H.C. wire and strip	ton £262 15s 0d
LEAD, English	ton £92 10s 0d
Foreign	ton £91 0s 0d
MERCURY	flask £61 15s 0d
TIN	ton £655 0s 0d
ZINC, G.O.B. Foreign	ton £72 0s 0d
Electrolytic	ton £75 0s 0d
BRASS Tubes	lb 1s [illegible]d
Sheet	ton £234 0s 0d
Wire	lb 2s [illegible]d
PHOSPHOR BRONZE	
Wire	lb 3s [illegible]d
RUBBER, No. 1 R.S.S. spot ..	lb 17[illegible]-18d

PARLIAMENTARY NEWS

By Our Special Reporter

AS reported in our last issue, the Postmaster General announced in the House of Lords on 1st December that he had signed an agreement for the provision of the first transatlantic telephone cable: this agreement would be presented to Parliament and would be subject to approval in the House of Commons. A similar statement was made by Mr. Gammans, the Assistant Postmaster General, in the House of Commons. In reply to Mr. Hobson, Mr. Gammans said that there would be submarine repeaters, about 110 in all, between this country and Newfoundland. They would use the American system, because the Americans had more experience than we had of deep-sea repeaters. But between Newfoundland and Canada the British system would be used.

Ships' Radio

In answer to Mr. Callaghan, Mr. Gammans said he was aware that uncertainty had existed for some time past owing to failure to reach international agreement on the system of modulation used for the very high frequency radio services in ships. The shipping industry and the radio industry (with the exception of one manufacturer) had agreed that it would be in the national interests to resume discussions internationally with a proposal in favour of standardization on frequency modulation, and there was at last some prospect of reaching agreement and of removing the uncertainty.

New Television Transmitters

Captain Orr asked why the permanent television transmitter for Northern Ireland could not commence service before the end of 1954.

Mr. Gammans said that during the next two years the B.B.C. not only had to replace the temporary television stations in Northern Ireland and North East England, but also to put up new stations in the Isle of Wight, South Devon, Aberdeen, the Isle of Man and the Channel Islands, which at present had no television service at all. This was a big programme and the Government was satisfied that it was being pressed on at all points as quickly as possible.

Interference from Electric Railway

Sir Ian Fraser asked the Assistant Postmaster General if he would make a statement as to the steps which his department was taking in co-operation with British Railways to investigate and remove the interference with television reception in Morecambe and Heysham arising from the Lancaster to Heysham electric railway.

Mr. Gammans said the tests made by Post Office engineers in co-operation with British Railways had so far been unsuccessful; their scope had been limited by traffic on the line. However, British Railways had agreed to withdraw all electric trains from the line for periods on four days. He hoped that this would enable the Post Office to trace the cause of the trouble and remove it.

Generating Sets for China

Mr. Swingler asked the President of the Board of Trade if he would now grant licences for the export of small generating sets, steel tubes and telephone cables to China.

Mr. Heathcoat Amory said that the export to China of steel tubes, telephone cable and generating sets of all sizes was prohibited in all the countries which were members of the Strategic Controls Consultative Group, and the Board was therefore not in a position to licence this trade.

Power Station Site

Mr. Llewellyn asked the Minister of Housing and Local Government whether he was aware that the proposed building of a power station at the Leys, Glamorgan, would destroy Gileston, among the loveliest of Glamorgan villages; and whether he was further aware that alternative sites were available in industrial Barry and Port Talbot.

Mr. Marples said he had heard that the electricity authority was looking into the possibility of building a power station in the locality, but he understood it had not yet applied for planning permission.

Attempts on Grid Lines

On 1st December, Mr. Niall Macpherson asked the Secretary of State for Scotland whether he would make a statement in regard to the explosion which damaged an electricity supply pylon at Skewbridge, near Dumfries, on Sunday, 22nd November.

Mr. James Stuart said that an explosive charge was set at two of the four steel pillars supporting a pylon at Skewbridge. One charge exploded, causing slight damage, the other failed to detonate. There was no interference with the electricity supply. Police inquiries were proceeding.

Later Major Anstruther-Gray asked the Home Secretary whether he would make a statement

regarding explosions near electric power pylons near the border between Scotland and England; and what further incidents had been reported to him since 23rd November.

Sir David Maxwell Fyfe said that on 24th November an employee of the British Electricity Authority found an explosive charge, with an electric timing apparatus, fixed to a grid pylon about one mile north of Cornhill-on-Tweed, Northumberland. He removed the detonators from the explosive and rendered the charge harmless. Soon afterwards the detonators exploded. Police inquiries were being made. No similar incidents had been brought to his notice since that date.

Powers of Entry

Miss Ward asked leave to bring into the House of Commons a Bill to regulate the exercise of statutory rights of entry by or on behalf of Gas and Electricity Boards. She explained that the Bill provided that, except in cases of emergency, forcible entry should only be exercised by the Boards after a warrant had been obtained from a justice of the peace, and signed, after sworn evidence had been given in writing. She mentioned that this procedure was embodied in the Water Act of 1945, and it would provide adequate safeguards both for the public and for the officials of the Gas and Electricity Boards.

Leave was granted, and the Bill was brought in and formally read a first time.

Sulphuric Acid Supplies

Mr. H. Strauss, Parliamentary Secretary to the Board of Trade, in moving that the Import Duties (Exemptions) (No. 5) Order, which imposes a 10 per cent *ad valorem* duty on imports of sulphuric acid, be approved, said that there was now no shortage of sulphuric acid. United Kingdom supplies were adequate and likely to remain so. Manufacturers had requested that the Order be reimposed.

Electricity in Scotland

Mr. John Wheatley asked the Minister of Fuel and Power whether his attention had been drawn to the speech made by the chairman of the South East Scotland Electricity Board to the Dunfermline Rotarians on 26th November, in which he discussed and appeared to disclose the principles of the proposed Government Bill to deal with the reorganization of the electricity supply industry in Scotland, and in which he also expressed strong personal views in relation to controversial matters connected therewith; and what steps were taken to prevent senior officials in nationalized industries who had been consulted in connection with the contents of a proposed Bill from discussing the contents in public before the Bill had been laid before Parliament.

Mr. Joynson-Hicks, the Parliamentary Secretary, said that the Bill referred to was still in course of preparation. The Minister had seen reports of the speech and had discussed it with the chairman of the Board. The views he expressed in that speech had for a long time been the subject of discussion in the industry and it must not be assumed that they were based on the consultations which had taken place on technical matters relating to the Bill. The conventions and requirements concerning the discussion in public of the subject matter of Bills before they had been laid before Parliament were, he thought, generally well understood and the Minister did not consider it necessary to take further steps in this regard.

In reply to a further question he said that the chairman was consulted in the early stages regarding the technical details, but the subject matter of his speech covered a wide variety of matters, most of which were of considerable interest in the Scottish discussions.

Mr. Wheatley asked the Speaker if it was not a breach of Parliamentary privilege that disclosures should be made about the proposed contents of a Bill by a person who was consulted by the department before presentation to Parliament.

The Speaker said there seemed to be a dispute about what actually happened, but there was no point of privilege.

Industrial Co-operation

Sir Wavell Wakefield asked the Minister of Fuel and Power what steps he was taking to increase the amount of co-operation between the electrical and gas industries upon problems of research in which both industries had a common interest.

Mr. Joynson-Hicks said the Minister's Scientific Advisory Council, on which both industries were represented, periodically reviewed research programmes in the whole field of fuel and power, and he was satisfied that this procedure gave ample opportunity for co-operation between the industries on common research problems.

Interference with T.V. Reception

Mr. Deer asked the Assistant Postmaster General if he was aware of the continued interference in television reception at Sutton-on-Trent near Newark.

Mr. Gammans said they knew now that the trouble was coming from somewhere on a 300 yd stretch of a h.v. line, but the exact location of the cause of interference had not yet been found. The East Midlands Electricity Board had attempted to cure the trouble by renewing certain pieces of equipment, but so far without success. A further test was due to be carried out next week. The difficulty in this case was that for a detailed examination of the line to be made the electricity supply of several villages would have to be cut off.

Lifts for Block Dwellings

Experience on L.C.C. Estates

MODIFICATIONS in the design and control features recommended in the Code of Practice of the Building Industries National Council, which experience had shown to be necessary in the housing schemes of the London County Council, provided the main theme of a paper presented by Mr. C. G. L. Morley at a meeting of the Utilization Section of the Institution of Electrical Engineers yesterday (Thursday).

Single-speed non-attended passenger lifts travelling at 100ft/min and serving a maximum of 50 flats, the author stated, were standard in block dwellings of four or more storeys. Common wells for two or more lifts would in his view be more economical, especially for buildings of nine storeys and upwards, and would facilitate maintenance and improve serviceability, but the terms of the Home Office subsidy did not encourage their use. Service lifts had been little used and were no longer provided.

Reducing Wanton Damage

Of the total cost of breakdown repairs, 80 per cent was attributed to misuse and malicious damage, largely by young people not usually living in the premises affected. This aspect was the dominant factor in determining design and methods of control, details of which were given. Misuse had been greatly lessened and reliability improved by removal of the emergency stop button from the car control station, mechanical locking of the car-door in travel, rigidly securing the emergency escape hatch and fitting a mechanical control station on the roof of the car to reduce risk of accidents during maintenance.

The effect of these modifications was that, in May, 1951, the monthly breakdowns of 200 lifts initially incorporating them was 0·37 as against 3·86 and 3·27 for two other designs. In December the figures were 0·58, 1·7 and 1·1, the last two designs having been progressively modified in the meantime. During March, 1953, the average breakdown rate for 500 lifts incorporating the modifications was 0·73. Particular attention was paid to the position and treatment of the motor room (costing at least £2,500 exclusive of building work), which, if situated at the top of the shaft, reduced the load carried by the structure by about 40 per cent and led to lower maintenance costs. A room height of 7ft was recommended. Electric cables to the lift motor were preferably installed in a chase 13½in wide by 4½in deep in the staircase wall and covered by wooden boards. The omission of a terminal box in the lift well eliminated trouble from loose connections; the flexible cables were anchored by grips half way up and at the top of the shaft and under the car.

Basic Design

Notes on the basic design of lifts included reasons for using power operated doors rather than spring or gravity control. For securing silence the most efficacious and reliable method was a floor selector system incorporated in the control panel and subjected to electrical impulses, which were originated when the car passed fixed positions. These positions were directly related to the stopping position of the winding unit to bring the car level with the landing. With several lifts the most economical distribution was by having a lock-up fuseboard in a motor room with separate fuse ways for each lift.

Block dwellings exceeding 80ft in height were required under the London Building Act to have at least one lift nominated as a "fireman's lift." This entailed the provision of a separate electrical supply and a special control circuit which, among other things, enabled a member of the fire brigade to stop the car and bring it to the ground floor.

Interference with radio and television reception could not be completely suppressed, but the installations fully met the requirements of the Postmaster General, which permitted some degree of intermittent interference similar to that caused by current-carrying contactors.

Graduate Science Teachers

IN a report to the Minister of Education (H.M. Stationery Office, 6d net), the National Advisory Council on the Training and Supply of Teachers declares that the shortage of graduate teachers of mathematics and science constitutes a national problem. The recruitment of mathematics and science graduate teachers is inadequate in both quantity and quality to meet current requirements. The Council makes certain suggestions which lie within the province of the Minister of Education and the local education authorities, but any action which could effect a radical improvement would require decisions on important questions of national policy, such as the size of the undergraduate population, the volume of postgraduate work at the universities and the appropriate level of recruitment of scientists to industry.

It is considered essential to correct the view current among many able young scientists that the universities and industry offer them opportunities to keep up-to-date in their subject and to make an original contribution to it which would be denied to them in the schools. This is by no means true of all posts outside school teaching, and it certainly does not do justice to the opportunities which exist in secondary grammar schools where science is well organized. The Council recommends that the Ministry should prepare a pamphlet on careers in education and hopes that the universities will consider how, with the help of this pamphlet and by other means, they can improve the guidance they give to undergraduates.

Scottish Electricity Supply

AT a recent meeting in Dunfermline, Sir Norman Duke, chairman of the South East Scotland Electricity Board, referred to the forthcoming Scottish Electricity Bill and outlined its probable form. He said that it was not anticipated that any change would impair the special responsibilities of the North of Scotland Hydro-Electric Board. The Bill was therefore likely to be concerned primarily with the supply in the south of Scotland. It was expected that the British Electricity Authority would be deprived of its responsibility for the generation of power in that area and that the electrical functions of the Minister of Fuel and Power in relation to Scotland would be transferred to the Secretary of State for Scotland.

Sir Norman Duke went on to say that, although in general administration Scotland was able to exercise freedom in carrying out policies in a way best suited to her own conditions, it was otherwise in the case of the nationalized industries. Here they were dealing with the large new organization centred for the most part in London and attended by all the difficulties and dangers of remote control. There was little attempt to treat Scotland as anything but a part of England and little recognition of the need for flexibility in national plans to secure efficiency and economy.

One general advantage likely to be gained from the new Bill was that the Scottish organization would combine generation and distribution. The present separation of the two functions was costly and confusing to the public.

Specialists and Sub-Contractors

SIR DAVID ECCLES, Minister of Works, was the principal guest at the annual luncheon of the Federation of Associations of Specialists and Sub-Contractors at the Savoy Hotel, London, on 3rd December. The chair was taken by the president, Mr. F. Woodcock, who in proposing the toast of "Her Majesty's Government" expressed the Federation's appreciation of the way in which the Ministries of Housing and Works were carrying out the Government's housing programme. Mr. Woodcock stressed the large part played by member associations in the building industry and mentioned some of the problems with which they were faced, particularly the time lag between the granting of building licences and the placing of the contracts.

In the course of his response Sir David Eccles congratulated the building industry upon increasing its output by 8 per cent during the past year. They were over the worst of the obstacles; there was now sufficient steel, cement and unused capacity available and before long there should be a steady flow of large contracts. In the nine months to September last licences to the value of £135 million had been granted and work to the value of £90 million had been started.

Mr. A. W. Gittins, in proposing the toast of the Federation, said that that body was fighting the "retention money" system. Its work included the maintenance of liaison with Government Departments with whom it enjoyed cordial relationships.

Mr. L. C. Penwill, director and secretary of the Electrical Contractors' Association, who is chairman of the Federation's Executive Committee, replied to the toast. He said that some of the specialists in the building industry had been operating for a very long time and their work was vital to the industry. They were an integral part of the building industry and could make an outstanding contribution if they were encouraged by the full co-operation of the industry. They had, particularly, a large part to play in the Government's building programmes.

The toast of the guests was proposed by Mr. P. C. Ford, senior vice-president, and Mr. C. H. Aslin, vice-president of the Royal Institute of British Architects, responded.

Nationalized Industries

Policy of the Parties

From an Industrial Correspondent

THIS year's Trades Union Congress and Labour Party Conference brought the question of nationalization prominently before the public. The debates, however, rather than clarifying the issue, served to confuse not only many members of the Labour movement itself, but the not inconsiderable body of unattached but observant voters whose influence at election times can be decisive.

It had long been an article of faith in Labour circles that full efficiency in the nationalized industries could not be realized without bringing under public control auxiliary and associated industries. The National Coal Board, it was pointed out, would have to co-ordinate the distribution of coal with its mining and fuel utilization schemes. The electricity supply industry, if it was going to provide consumers with an adequate and satisfactory service, would have to exercise the powers given to it in the Electricity Act "to sell, hire, or otherwise supply electrical fittings and to install, repair, maintain or remove any electrical fittings." And there was a similar provision in the Gas Act.

Control of Equipment Supplies

It was further assumed that the industries servicing the nationalized undertakings would also have to be brought under some form of public control in order to ensure regular and adequate supplies of materials and equipment to these undertakings. The "Plan for Engineering," sponsored by the Confederation of Shipbuilding and Engineering Unions, was largely based on this assumption, particularly the proposals for the public control of or transfer to the fuel and power industries and national transport of the manufacture of heavy electrical plant and equipment, mining machinery, and railway locomotives and carriages.

The final aim was nothing less than the integration of Britain's basic industries in one national plan, the organ of which—the Economic Planning Board—had already been established by the Labour Government in 1947. The proponents of the plan argued: If co-ordination could be achieved in fuel and power, why not in other industries? For nationalization was not to be just the organization and transfer of ownership to the public of this or that industry. Nor was it to be the extension of public ownership in those industries already partly publicly owned and controlled. Nor yet was it to be, as in the case of the coal industry, a means of saving an industry exploited almost to the point of exhaustion. Nationalization, as envisaged in the resolution on "A Planned Economic Democracy" adopted by the 1942 Labour Party Conference, was to be the great unifier and integrator of industry, the first step to a Socialist Britain.

Plan Shelved

But this grand design, presented for the last time by Mr. George Strauss when introducing the Iron and Steel Bill, was dropped even before the first outline could be traced. The Economic Planning Board never rose above the status of a consultative and an advisory body. Even the bright promise of co-ordination and integration of existing nationalized industries has not been realized.

It is true that there has been limited co-ordination in fuel and power, but it has been on nothing like the scale contemplated. While the gas industry has managed in South Wales to link its Eastern Grid with the National Coal Board's coke ovens and its Western Grid with the Margam Steel Works, these have been examples of conserving natural resources rather than exercises in co-ordination. There is, as yet, only the agreement between the National Coal Board and the British Electricity Authority on a scheme for building and operating pithead power stations, linked with the grid; and the provision in the Gas Act which allows the National Coal Board and the Gas Boards to co-ordinate their carbonization activities.

On a higher level, the Ridley Committee had recommended that the Minister of Fuel and Power should establish a Joint Fuel and Planning Board. This recommendation was based on the assumption that the main purposes of co-ordination in the production and distribution of fuel and power are:—

(1) To facilitate joint planning in the supply of fuel and power, including the development of new techniques.

(2) To collaborate with the Minister of Fuel and Power's Scientific and Advisory Council and other scientific bodies concerned in promoting research and development involving more than one of the fuel industries.

(3) To secure routine technical collaboration at all levels.

(4) In the last resort, to ensure collaboration where the interests of one industry might not coincide with wider interests.

Limited Proposals

These proposals could not be described as revolutionary. But they were, apparently, too bold for the Government, and were not accepted. It was decided, instead, to set up a non-profit-making company, the chief concern of which would be with fuel efficiency and not with fuel and power co-ordination, except as it was coincidental with efficiency.

The only co-ordination at present envisaged for the fuel and power industries was that outlined by the Minister of Fuel and Power in the recent debate on the nationalized industries, and this is to be largely concerned with securing economies in the use of fuel and power by improved technical methods and appliances. Indeed, the debate was not only in the nature of a commentary on, but in some ways a sequel to the proceedings at this year's Trades Union Congress and Labour Party Conference. Like the General Council of the T.U.C. and the National Executive Committee of the Labour Party, neither the leaders of the Government nor the official spokesmen for the Opposition visualized any extension of nationalization or any startling developments in co-ordination of the existing nationalized industries.

What actually emerged from the debate was that both the Government and the Opposition were satisfied with the present state of affairs. All that was asked was that the fuel and power industries should continue to make themselves more efficient by producing more coal and gas and their by-products and more electricity at lower cost. As the Parliamentary Secretary to the Ministry of Fuel and Power phrased it, " these nationalized industries in developing their own industries, consolidating their own position, are improving their own efficiency as they serve the public with an increasing supply of their commodities." This view had earlier been expressed by the Minister himself. What he considered was " the next in order of priorities " (for coal) were " the big industrial users." " In this connection," he said, " I am thinking primarily of the steel industry, cement, the sugar refineries, the breweries and other big industrial users to whom the cost of coal is a big item and a big proportion of the total cost of production."

A more general statement of this view was given in the Parliamentary Secretary's summing up. " Seven years ago," he said, " we knew private enterprise and we knew Government service, but now the statutory undertakings, commercial enterprises which are responsible to Parliament in the last resort, are beginning to take their natural place in the field of industrial enterprise throughout the country and we are linking up private enterprise and Government service."

If this has any meaning at all, it means that the primary function of the nationalized industries is and must continue to be the servicing of private enterprise industry as cheaply as possible.

The Opposition had no views at all to offer on the matter, beyond vague suggestions that the nationalized industries had proved themselves. Their views had been expressed for them at Douglas and Margate and in the T.U.C.'s " Interim Report on Public Ownership," and in Labour's policy statement, " Challenge to Britain."

The next steps in nationalization are likely to be backward instead of forward. The denationalization of iron and steel will certainly not bring about co-ordinated integration with the fuel supply industries. Any plans which may have been considered for a closer working partnership between the coal industry and the chemical industry will follow in the pattern of approved commercial practice. Not for another decade does it seem that there will be any further excursions into the largely uncharted land of industrial nationalization.

FUEL POLICY

House of Lords Debate

A DEBATE on fuel policy was initiated in the House of Lords on 2nd December by Lord Lawson who drew attention to the recent Report on Fuel Conservation by the British Productivity Council in which a national fuel policy was advocated. In the course of the debate Viscount Ridley said that the subject was closely related to the work of the committee of which he was chairman. He agreed with the Council that there was a great deal of room for improvement in our methods of using coal, but questioned one or two of its proposals.

He thought that those who stressed the need for what was called a " national policy " should be more specific as to what they had in mind. It had been proposed that there should be a Commission to study the subject and formulate a national fuel policy. On what instructions should such a Commission work? What should be its object? Should it be to conserve fuel of all kinds on the basis of fuel efficiency? Should it be to conserve fuel and other resources —to achieve the maximum overall economy both of coal and such things as building equipment and machinery? Should it be a policy which would be applied by Government direction? Or should it be a policy which people who used coal in so many ways would naturally follow?

Choice of Fuel

The conclusion of his Committee had been that only a policy imposed by the Government could be adopted and the Committee (and most other people) was definitely against that. The references to the specification of uses of electricity in the Council's report suggested a policy of the best use of each fuel for whatever purpose it was best suited. His Committee had gone into that subject and had concluded that on the basis of thermal efficiency there was little in it. There was, however, very little argument as to what was the best use of fuels on the basis of total cost and the total effort required to produce them.

On the basis of capital investment there were variations. Considering the use of electricity for space heating, he thought that the minds of most people in this country were rather conditioned to look on such a process with some suspicion because of the difficulty we had in very cold winters when suffering from shortage of electricity generating plant after the war. It then became Government policy, quite rightly, that electricity should not be so used, because the demand came at the peak hour. That was a basis not of the amount of coal consumed, but of the amount of plant available for generating electricity. But even if that were taken into consideration, there was no clearly valid argument against the use of electricity for such purposes.

The present situation was that the electricity generating system of this country was in the process of being renewed. The last report of the British Electricity Authority gave the average thermal efficiency of all its plants as something like 22 per cent because of the use of old plant which had been kept in use longer than was originally intended, because of the war and because of the rapid increase of demand. As opposed to that figure, modern plants showed a thermal efficiency of 31 per cent or, perhaps, 32 per cent. So from the point of view of coal consumption alone there was urgent need to invest a fairly large sum in the replacement of much older plant. That being so, we were not likely, at any rate within the next ten or fifteen years, to be in a position to build new plant for the exclusive purpose of meeting a particular peak demand such as that to which he had referred.

He only mentioned this point because it was useful when we tried to analyse our objectives when we talked about a national fuel policy and the use of all fuels for the purpose for which they were best suited.

Provided that the prices paid by the user of each type of fuel actually corresponded with the fuel or the services he got, and provided there were sufficient incentives to be a strong encouragement to the user to use the fuel in the most efficient way, we should find, as that process worked itself out, that the best use of all those fuels in the national interest would, in fact, turn out to be the use which people in those circumstances wanted to make of them. Therefore, he did not favour the proposals in the productivity team's Report, which envisaged the setting up of a Commission to inquire into such points.

Suggested Co-ordinating Board

The other point made in the productivity team Report about which he felt some doubt was the rather parallel proposal that the nationalized coal, gas and electricity industries should be co-ordinated under a Fuel and Power Board.

After considering the actual need for such a Board, his Committee had found some need for a link between all these industries, but only to the extent that there were new processes where techniques of production would need to

be developed by more than one board—for instance, the combined generation of gas and electricity. For the moment, and for a long time maybe, those new operations were only on the fringe of the work of the two boards.

The Committee thought there was need for a board composed of these industries to give the Minister advice as these new techniques developed—it had only these new techniques in mind—so that practical means of putting them into effect could be worked out. The Government had not adopted that recommendation, but so long as the Government saw that these industries did get together and discuss these things, it was not a matter of so much concern whether they did it within the Ministry or more formally by the machinery which his Committee proposed.

That was a very different matter from having a board to run and manage the whole of the three nationalized industries. It seemed to him impossible to have such a large section of public activities entirely out of the control of Parliament and in the hands of a separate and independent body without any Minister capable of answering to Parliament and without any connection with the country's general policy.

Viscount Hall, in a contribution to the debate, agreed with Viscount Ridley that the electricity supply industry had done a good deal in increasing thermal efficiency. Reference was made to the much higher efficiency of American power stations. Their lordships would be amazed at the results achieved here if they saw some of the fuel which was being used by the B.E.A. Indeed 90 per cent of the fuel was of a most inferior kind which could not be sold elsewhere. He had seen some of the American stations with their huge dumps of cleaned and graded coal.

Speaking for the Government, the Paymaster General (the Earl of Selkirk) mentioned the incorporation that day of the National Industrial Fuel Efficiency Service, under the chairmanship of Air Chief Marshal Sir Leslie Hollinghurst, of which Sir John Hacking was a member. Lord Selkirk agreed with the Ridley Committee's view that the choice of fuels must be left to the consumer. Among other matters referred to by his lordship were dual-purpose generating stations, the abandonment of the "restrictive conditions" on private generating plant, wind-power experiments, the development of water power and the prospects of atomic energy.

Purchase Tax Rebate Scheme

A NUMBER of trade associations, including the British Electrical and Allied Manufacturers' Association, the British Radio Equipment Manufacturers' Association, the British Refrigeration Association, the British Synchronous Clock Conference and the Electric Water Heater Manufacturers' Association, have put before the Chancellor of the Exchequer for his consideration a scheme by which retailers of goods subject to purchase tax would escape the adverse effects which they experience when the tax is reduced.

Among the considerations which had to be borne in mind in devising such a scheme were that the goods should be readily identifiable; the scheme should be entirely voluntary and precise enough to prevent tax evasion; it should be easily administered and flexible; and undue delay should be guarded against. Each industry would have to agree with the Customs and Excise authorities the goods to be included. Once the scheme was introduced it would be in continuous operation and capable of being verified at any time.

The goods which are at present readily identifiable are in the main high priced, bulky and durable but usually of a nature for which the "sale or return" arrangement is not suitable, as they are easily marked or damaged in transit and handling.

The memorandum mentions difficulties encountered in operating "sale or return" schemes and claims that the plan now submitted is less detailed and cumbersome. It is suggested that claims under the scheme should be admitted for all tax-paid stock appropriated since the 1953 Budget and should be admitted for all subsequent reductions in the rate of tax.

The scheme provides that the registered trader shall sign an undertaking to mark his goods with indelible serial numbers; maintain a record of the disposal of these goods by their serial numbers; ensure, where applicable, that the serial number or other means of identification is clearly marked on the outside of the container; note the serial number on all relevant documents; and take all reasonable precautions to ensure the accuracy of all claims from unregistered traders (see below). The unregistered trader shall sign an undertaking to maintain from 1st January, 1954, stock records in a simple and uniform manner; obtain a statement of new unsold tax paid stock held as at the date on which the reduction of purchase tax became effective; and submit a certified claim to each registered trader within 21 days after the reduction in purchase tax.

Recovery of purchase tax arising from the operation of the scheme shall be accounted for to the unregistered trader by the registered trader after the claim has been agreed by H.M. Customs and Excise.

Suggestions for appropriate forms for the foregoing purposes accompany the memorandum.

Coronation Broadcasts

Greetings Exchange with Canada Opens I.E.E. Discussion

THE discussion which followed the paper on technical arrangements for the sound and television broadcasts of the Coronation ceremonies (reported in the *Electrical Review* of 4th December) was opened by mutual radio greetings between the Presidents of the I.E.E. (Mr. H. Bishop) and of the Engineering Institute of Canada (Mr. Ross L. Dobbin), speaking from Montreal.

Dr. A. C. Don, Dean of Westminster, said that the knowledge that the ceremony was being broadcast had seemingly no adverse psychological effect on those taking part.

Mr. J. E. Hayes, speaking from Montreal, paid a tribute on behalf of the Canadian Broadcasting Corporation to the B.B.C., whose co-operation had enabled television pictures to be reproduced in Canada and the U.S.A. within 11 hours of the event.

Mr. F. Williams, replying on behalf of the authors, mentioned that valuable lessons had been learnt by the B.B.C. from the recording of the final rehearsal.

Sir John Hacking, who had visited Canada a year ago, expressed the hope that the closer collaboration between the I.E.E. and the Engineering Institute of Canada would be developed as soon as the details could be worked out.

Problem of Television Recording

The discussion in London was continued by Sir Noel Ashbridge, who, referring to the use of television pictures to help commentators to give an ordinary sound broadcast, suggested that this idea might be extended in countries which would not get television for some years, since it was often difficult to give a single commentator a good view of what was going on from several angles. Commenting on a 35 mm film taken from the telerecording of the Abbey ceremony which was shown at the meeting, Sir Noel said that one of the most important technical problems was to produce a good, reliable and economic means of recording television programmes, which so far was not up to the standard of sound broadcasting. He had been surprised, however, to see the good results obtained by the suppressed-frame method.

Mr. H. Faulkner (G.P.O.) emphasized the great use which had been made of ordinary telephone lines to assist the outside broadcasts, although the frequency band of a telephone circuit had to be stretched 1,000 times to make a television channel. A special equalized amplifier would shortly be introduced which could be carried in a suitcase and used for equalizing a pair of telephone lines for 3 to 5 miles in any part of the country. The repeaters used about every six miles on coaxial cable were also useful, because outside broadcasting could be injected at these points. This apparatus had been used to televise the Queen's departure from London Airport.

Reception in France

Monsieur S. Mallein (Radiodiffusion-Television Française) thanked the B.B.C. for their collaboration, which had enabled about two million people in France to see the Coronation. The pictures received in Paris had been very good, although there had been difficulty with the synchronizing signals.

Mr. N. Sizer (Office of Works) mentioned that the normal Abbey load of 15 kW had been increased to 320 kW for the Coronation. In a nearby Government building stand-by diesel alternators had been installed to which at the final rehearsal the load was changed over in 27 seconds ; the B.B.C. had also installed stand-by batteries.

Mr. G. Dawson described the space diversity receiving system at Cap Blanc Nez. The two aerials were spaced vertically above each other about 15ft apart, which gave good reception on one or other aerial for a wide variation in conditions. There was fading on the lower aerial in the morning and on the upper one during the afternoon. By this means a permanently reliable circuit could be set up across the Channel.

Mr. F. Axon (B.B.C.) said that to avoid a recurrence of a magnetic storm in the sun, the " Voice of America " placed at their

disposal four high-power transmitters in Tangiers, so that during a critical three-quarters of an hour of bad conditions signals to North America could be maintained. The C.B.C. lent them two transmitters to beam into Central and South America, and the broadcasting stations in that region relied on them for much of the time. One station which failed to get the Canadian transmission was able to pick up Radio Australia. Altogether 2,700 stations all over the world had been able to take the B.B.C. programme for eight hours continuously. At one time about half the total spectrum in the h.f. broadcast band had been occupied by the B.B.C. programme.

Mr. J. Bell (Muirhead & Co.) described the arrangements made by the use of picture telegraphy with the direct recording system to send still pictures of the ceremony to America to be shown along with the live broadcast. During the first four hours 96 pictures had been transmitted and shown only 6 to 14 minutes behind the events in the Abbey.

Control Systems

IN a triple bill arranged by the Institution of Electrical Engineers (Measurements Section) for 8th December, the first paper, presented by Mr. R. L. Ford, was concerned with the determination of optimum process controller settings.

Dividing the process controllers into three types of action, namely proportional, derivative and integral, he developed an analytical method in relation to the first two for two-term (proportional plus derivative) and three-term control. This method was unsuitable for ascertaining the best integral setting in three-term control and the solution of the problem was found in the use of an automatic electronic simulator. This simulator also served to confirm the theoretical results of the analysis and to supply without laborious computation other information regarding the transient responses of control loops. Numerous examples of process control with and without self-regulation were worked out.

The second paper, by Dr. J. C. West and Messrs. J. L. Douce and R. Naylor, discussed the effects of the addition of non-linear elements on the transient performance of a simple remote-position-control system possessing amplifier saturation. The authors pointed out that saturation characteristics of the amplifier or motor in position-control servo mechanisms and allied on-off systems could be made a desirable feature instead of an unwanted non-linearity. Transient response to large inputs could be improved by introducing further non-linear elements which was done in two systems described. On account of the non-linearity, however, prediction of response to an arbitrary input was extremely difficult and further investigations of response to non-sinusoidal inputs were required. Either velocity feedback or phase-advance networks could be used for stabilization and in all cases considered the system became linear in operation for small input signals.

Velocity feedback as a method of stabilizing remote-position-control servo mechanisms, the analysis of which was based on linear theory, was also referred to in the final paper in which Dr. West was partnered by Mr. I. R. Dalton. The subject was the step-function response of such mechanisms possessing torque limitation. In this a study was made of the way in which saturation in one or more elements in the loop affected the degree of dumping as the magnitude of the input step was increased. The results applied only to the system discussed, which, however, formed the basis of many control systems. Reasons were given for the adoption of the phase-plane approach in the analysis.

Electronics Exhibition

The annual Electronics Exhibition, organized by the North-West Branch of the Institution of Electronics, will be held from 14th to 20th July next year at the College of Technology, Manchester. The exhibition will include a scientific and industrial section and a commercial section displaying manufacturers' products, and there will be a programme of lectures.

Presentation to Cambridge

B.E.A.M.A. Gift to Mark Endowment of Chair

THE final stage in the presentation of the silver rosewater dish and ewer to Cambridge University by the British Electrical and Allied Manufacturers' Association was reached on 1st December when Mr. D. D. Walker, chairman of the B.E.A.M.A. Council, handed over the plate to Mr. Henry Willink, Q.C., Vice-Chancellor of the University, in the Master's Lodge of Magdalene College of which Mr. Willink is Master.

In presenting the dish and ewer, Mr. Walker described himself as the humble spokesman of the donors and said it was a very great pleasure to him, as an old Cambridge man. They hoped and believed that the ceremony would mark the beginning of a great and important development in the University. There was an urgent need in the electrical industry for advanced men and specialists, and they presented this commemorative gift to mark the endowment by the Association of the Chair of Electrical Engineering and in recognition of the work the University was doing to provide the men.

Expressing his pleasure on accepting the gift, the Vice-Chancellor remarked that he was glad to be supported by the Master of Pembroke, Mr. S. C. Roberts, who, as Vice-Chancellor two years previously, had received the cheque for the actual endowment of the Chair; by Professor E. B. Moullin, of King's College, the first and present holder of the Chair; and by Professor J. F. Baker, Head of the Department of Engineering. He had been told that the actual beginning of the endowment flowed from the Institution of Electrical Engineers, and they were glad of the presence of the Institution's President, Mr. H. Bishop. He also welcomed Sir George Nelson (a past-president of the B.E.A.M.A., and chairman and managing director of the English Electric Co.), Mr. G. R. Hughes, formerly Clerk to the Worshipful Company of Goldsmiths, who organized the competition for the winning design, and Mr. M. E. Gould, the successful designer.

Introducing Mr. Walker at the beginning of the ceremony, Sir Harry Railing, President of the B.E.A.M.A., said that it was especially pleasant for him to be present because the idea of a Chair first took practical expression when he was President of the Institution of Electrical Engineers. The work was then continued by the B.E.A.M.A.

A second ceremony took place when Mr. G. L. Yates, past-chairman of the B.E.A.M.A., presented Professor J. F. Baker with framed drawings of the trophy.

Others present included Col. B. H. Leeson, C.B.E., director of the B.E.A.M.A., Mr. T. F. Lister, past-chairman, Mr. E. H. Ball, vice-chairman, Mr. W. J. Brown, solicitor, and Mr. J. Oldroyd, secretary.

Mr. D. D. Walker (left) presenting the ewer and rosewater dish to the Vice-Chancellor

As we have already reported, member firms of the B.E.A.M.A. subscribed £72,000 to ensure the perpetual endowment of the Chair. The gift symbolizes the University, whose arms appear in enamel and gold in the centre of the bowl and on the ewer. The arms of the 21 Cambridge colleges appear in flutes round the inside of the bowl.

M.K.S. System Courses

TWO short courses are to be held in Bristol to advance the use of the rationalized metre-kilogram-second system of electrical units. The courses, arranged by the Regional Council for Further Education for the South West in collaboration with the Bristol Education Committee, are planned to cater for teachers of physics and engineering in universities, technical colleges, etc., for engineers and physicists in industry, and for all interested in problems of electrical measurement. There will be a full-time course from 2nd to 4th April at Wills Hall, Stoke Bishop, Bristol, 9, the fee being £1 1s, plus a residential charge of approximately £2 15s, and a part-time course at the College of Technology on six evenings (Mondays and Wednesdays) of the weeks commencing on 26th April, and 3rd and 10th May, the fee for which will be £1 1s. Applications should be sent to the secretary of the Regional Council, 12, Lower Castle Street, Bristol, by 31st December.

COMMERCE and INDUSTRY

Proposed Moscow Visit

A.E.U. Recommendation on Wage Claim

IN the House of Commons last month Mr. Eden, the Foreign Secretary, described the British Council for the Promotion of International Trade as a "Communist-front organization." The British Council was at that time organizing a visit by a party of more than 30 British business men, representing some of Britain's major industries, to Russia, but when many firms severed their connection with it after Mr. Eden's remarks, the Council cancelled the air passages and visas.

Nevertheless, in view of Mr. Eden's statement that the Government favoured two-way business visits between the United Kingdom and the U.S.S.R., a number of business men decided that it would be opportune to organize a combined visit in order to take advantage of any arrangements already made by the Russian authorities. A committee was elected, comprising Mr. J. B. Scott (sales director of Crompton Parkinson, Ltd.), Mr. J. B. McRostie (Johnson & Phillips, Ltd.), Mr. A. N. Jackson (J. Stone (Holdings), Ltd.) and Mr. A. F. Jeans (Mullard Overseas, Ltd.).

The Board of Trade informed the group that a visit of this nature would be in accordance with the statement of the Foreign Secretary and with its policy of expanding trade with Russia in non-strategic goods. It was contemplated that the visit would take place before Christmas but this proved impracticable and it was postponed. Mr. Scott said last week that this postponement did not mean in any way that they had given up the idea of the visit.

It was later announced that thanks to the active co-operation of the trade representative of the U.S.S.R. in the United Kingdom, the All-Union Chamber of Commerce in Moscow was prepared to help the group to carry out trade talks there in January. The talks will be with the trade organizations of the U.S.S.R.

We are informed that in addition to the companies already mentioned the party will include representatives of the Lancashire Dynamo Group, the Brush Group, Enfield Cables, Ltd., and Blaw-Knox, Ltd.

Plastics Exhibition and Convention

The biennial British Plastics Exhibition is to be held at Olympia, London, from 1st to 11th June, 1955. As in former years, a convention will be held concurrently with the exhibition. This will be the third British Plastics Exhibition and will represent all sections of the industry, including raw material suppliers; manufacturers of moulding powders, synthetic resins, and plastic sheeting; moulders and fabricators; manufacturers using laminated plastics and reinforced plastics; and manufacturers of moulding plant and other essential equipment.

The exhibition and convention are organized, as before, with the full co-operation of the British Plastics Federation, by *British Plastics*, Dorset House, Stamford Street, London, S.E.1.

Engineering Wages Dispute

Although an appreciable proportion of the members of the unions involved in last week's one-day strike reported for work most engineering establishments had to close down completely or operate on a very low level.

At a meeting of the executive committee of the principal craft union, the Amalgamated Engineering Union, on Thursday last week it was decided to recommend to the Confederation of Shipbuilding and Engineering Unions a ban on overtime and piecework throughout the industry. It is believed that if this step is favoured it will not take effect until about the middle of January.

Some delegates to the meeting endeavoured unsuccessfully to secure the acceptance of amendments (*a*) seeking to defer consideration of the suggested ban; (*b*) confining the ban to overtime alone; and (*c*) advocating the calling of a general strike in the industry.

Ideas for Home Lighting

A new standard guide for home lighting, the "I.E.S. Recommended Practice for Residence Lighting," has been published by the American Illuminating Engineering Society. This 44-page, fully-illustrated booklet is primarily devoted to the basic lighting requirements for family activities involving close vision, such as the selection and placing of portable lamps for sewing, reading, reading in bed, desk work, piano playing, kitchen and laundry activities.

Desirable types of table and floor lamps for such activities are shown, and accurate measurements as to their position with respect to the work and user are given in inches. Types of installed lighting fixtures for living rooms, dining rooms, bedrooms, kitchens and bathrooms with accurate directions for obtaining maximum efficiency and value are included. The report also covers lighting of special areas

such as playrooms, cupboards, porches and outdoor areas. Each of these lighting problems receives full treatment in the text, and most are illustrated to show how the completed lighting job looks.

Interior finishes and their reflectances are dealt with and much other useful information relating to home lighting is included in tabular form.

Paper for Insulation

We had an opportunity last week of seeing a short film showing how paper is made, from the raw material through the many stages of preparation to the finished product. While the subject with its helpful commentary was of great interest to us as a journal, as it covered the manufacture of printing paper, it contained much of interest from an electrical viewpoint. Descriptive sequences showed the application of paper for insulation purposes particularly in cable making, circuit breakers, grid lines and substations. The film, entitled "The Papermakers," was made at the Tullis Russell Mills at Markinch in Fife, a source well known for paper for electrical purposes. It runs for half-an-hour and is available on free loan to trade associations from the G. B. Film Library, Aintree Road, Perivale, Brentford, Middlesex.

Silicone Rubber Exhibition

The properties and applications of "Silastomer" silicone rubber were demonstrated at an exhibition which Midland Silicones, Ltd., in conjunction with a number of their customers, held last week at 11, Upper Brook Street, London, W.1. Besides being resistant to oxidation, oils, chemicals, shock, abrasion and both mechanical and electrical fatigue, "Silastomer" retains its resilience and other rubber-like properties at −100 deg F to +500 deg F. Its dielectric properties show little change over a wide range of frequencies even after ageing at high temperatures. Surface resistivity is high and its thermal conductivity is about twice that of either organic rubber or resinous insulating materials.

Sections of the exhibition indicated particular uses in the aircraft, engineering and electrical industries, that devoted to the last-mentioned including a transformer coil former, cable insulation, cowls and gaskets in micro switches, shrouds for protecting switchgear from oil and dirt, heating elements between sheets of glass cloth spread with silicone rubber, "Silastomer" bonded to mild steel for instrument mountings and bushes, "Silastomer"-glass insulating tape, terminal assemblies and heating blankets.

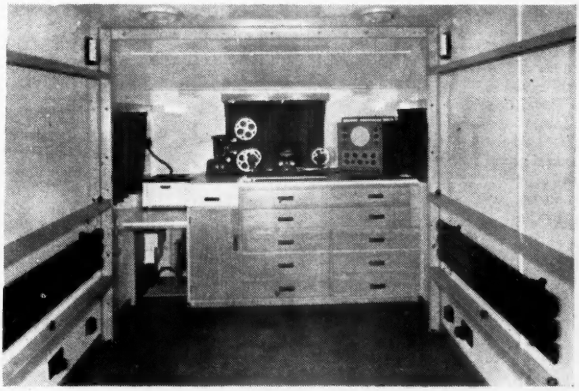
"Enfield Review"

Bearing the above title, a new quarterly bulletin is being issued by Enfield Cables, Ltd., under the editorship of Mr. R. T. Lythall, M.I.E.E. Its purpose is "to bring home to readers all over the world some of the more specialized aspects of electric cable manufacture and use." Pursuing this aim, the first number (following a foreword by the Earl of Verulam) deals with the installation of Enfield cables at the Chadderton (Lancs) and Doncaster power stations, with illustrations and diagrams. For the rest this number gives brief illustrated particulars of other work for which Enfield cables have been employed.

Mobile Testing Laboratory

The testing of equipment on remote sites has always been a difficult business for manufacturers of heavy electrical plant. The transporting of delicate scientific instruments is a big problem in itself, but often it is found on arrival that there is no space for setting up the apparatus under shelter. In many places darkrooms are not available, and thus photography cannot be used to aid investigations unless the films are sent to the works or some local chemist for processing, often with considerable delay. The English Electric mobile testing laboratory has been built to overcome these difficulties; it makes possible the investigation and recording on any site of transient and recurring phenomena relating to all electrical machines and circuit breakers made by the company. Vibration and

Testing equipment on the workbench of the English Electric mobile laboratory



noise can be measured and analysed, and provision is made for high-voltage testing.

The laboratory consists of a towing vehicle and trailer. Special equipment built for the laboratory includes a high-potential testing set and cathode-ray and "Duddell" oscillographs. The oscillographs can investigate up to six traces simultaneously and record them on continuous drum and roll films, which can then be developed in the well-equipped dark-room. Other photographic equipment includes a quarter-plate camera, a 16 mm ciné camera taking up to 64 frames per sec, a 16 mm projector showing films at speeds as low as 2 frames per sec, and a manually-operated projector by which individual frames of the ciné film can be investigated on a ground-glass screen.

Power supplies are normally obtained on site, sufficient cable being carried to connect up to any suitable point in the immediate vicinity. Water for use in the dark-room is carried in two tanks under the floor of the trailer and is electrically pumped to the taps. An electric water heater is also installed.

The test equipment is earthed to a copper strip running under the floor of the trailer and this is connected to a cable that can be run out and coupled either to the apparatus under investigation or any other "earth" that happens to be convenient. The comfort of the personnel has not been neglected and thermostatically-controlled electric heaters, a wash basin and an electric hotplate are installed in the trailer. The heaters also help to counteract condensation in humid atmospheres.

Investigation Committee Urged

With one dissentient, the North-Eastern Area Council of the National Chamber of Trade at Wakefield last week passed a resolution, moved by Mr. F. Lapish (Bradford), urging the formation of an investigation committee to effect greater administrative efficiency in the nationalized gas and electricity undertakings. The resolution also "viewed with alarm" the increases in tariffs and deplored the manner in which the two industries could continue to demand increased charges without being accountable for their actions. Mr. Lapish pointed out that although Bradford would not suffer unduly under the new electricity charges, the large consumers of gas, such as bakers, would have to face an increased cost of about 87 per cent.

Cathodic Protection

Corrosion of underground water pipelines is estimated to cost this country at least £5 million a year. One of the ideas for combating this corrosion which has been investigated in Britain and other countries is cathodic protection. This is a method of using small electric currents to divert the effects of corrosion to expendable scrap metal buried nearby. A book on the subject has recently been published in Russia and an English translation of it is now available. It is entitled "Cathodic Protection of Pipelines and Storage Tanks," by V. A. Pritula, and it has been published for the Department of Scientific and Industrial Research by H.M. Stationery Office, price 10s (2 dollars 25 cents U.S.A.), by post 10s 6d. Of particular practical help is the attention which has been given to methods of calculation required for various types of installations.

Induction Heating Equipment

An exhibition of induction heating equipment has been arranged by Birlec, Ltd., and Philips Electrical, Ltd., in conjunction with the Midlands Electricity Board (Birmingham and District Sub-Area) at the Board's showrooms in Chester Street, Aston, Birmingham. It was opened on Monday last and continues daily from 10 a.m. to noon and 2 to 4 p.m. until 18th December. The exhibits include a standard Birlec automatic unit for surface-hardening shafts or similar pieces having a length up to 20in and diameters up to 1¼in, at up to 500 pieces an hour. Power is provided by a Philips 25 kW valve-type high frequency generator. A ring gear shrinking heater shown is a standard 17 kVA Birlec ring heater which operates directly from 50 c/s mains.

The compact dimensions of a bar heater for forging and upsetting permit it to be installed close to the hammer or press with its associated Philips 50 kW power generator. In large plants a generator of higher power may be located in a central substation to serve a number of heaters in the shop. Another item is a brazing unit for non-ferrous components, power for which is derived from a Philips 2½ kW valve-type generator. For demonstration purposes the unit is shown brazing end-plugs in non-ferrous tubular components.

New Cleckheaton Factory

The new factory of F. W. Birkett & Sons, Ltd., power transmission engineers, at Cleckheaton, Yorkshire, is a single-storey brick and steel building on a 3 acre site. It is entirely self-contained. The 7,000 sq ft foundry is equipped with the latest mechanized sand conditioning plant, with the sand delivered to the pneumatic moulding machines by endless conveyor belts. The moulding boxes, after completion, are placed on casting conveyors, where they are filled by overhead tilting ladles. After casting, the boxes are conveyed on to the vibratory knockout, after which the empty boxes are returned by conveyor to the various moulding machines. The castings, after being separated from the moulding boxes, are cleaned and dressed in the fettling shops, where various machines are installed for separating the castings from the runners and risers. All castings are then

shot blasted before being taken into the casting store ready for machining.

The two machine shops are equipped with automatic, semi-automatic and turret lathes, together with the usual milling, drilling and shaping machines. Sand cores are made in a modern shop, where compressed air core blowers are used. Adequate washing and canteen facilities are available for the employees.

Trolley-bus Rheostatic Braking

A system of rheostatic braking for trolley-buses, which has had over two years' successful service in a trolley-bus of Reading Corporation Transport, is being fitted to three equipments ordered from the General Electric Co., Ltd., by the Tranvia Electrico de Pontevedra, Spain. With this "I.R." system, in order to avoid risk of damage to the transmission, the maximum braking torque at high speeds is limited by inverse excitation from a field winding connected in series with the motor armature across the line. At low speeds this winding and the section of the motor series winding which is left in circuit during braking act cumulatively to provide a braking effort nearly to a standstill. The result is a more constant braking effort curve than is obtainable by other methods, while the hot and cold performances correspond closely.

Cable Makers' Wage Increase

In dealing last week with an award of increased wages by the National Joint Industrial Council for the Electric Cable-Making Industry we said: "It is provided that the payment by results formulæ shall be maintained, with the new standard time rate. With this exception, payment by results workers will not receive any further increase." We are told that this is misleading.

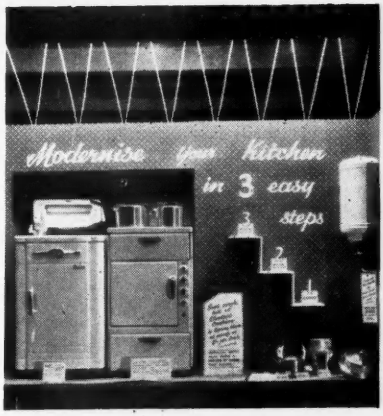
The Council says that the wording of its notice was not intended to imply that the increases of 1d per hour to men and ¾d to women do not apply to payment by results workers, who will receive the increases but will not, as a consequence, receive increased bonuses provided the latter conform to the adjusted N.J.I.C. formulæ.

Aluminium Conductor for Canada

A Canadian order worth about $\$\frac{3}{4}$ million has been obtained by the Aluminium Wire & Cable Co., Ltd., for the supply of steel-cored aluminium conductor to the British Columbia Electric Railway Co., Ltd., for delivery during the first half of 1954.

N.W.E.B. Window Display Competition

Mossley (Cheshire) Service Centre, in the No. 3 Sub-Area of the North Western Electricity Board, has been nominated winner of the Board's annual window display competition.



Mossley Service Centre, winner of the annual window display competition organized by the North Western Electricity Board

The man responsible for the winning Mossley display was Mr. Ronald Barnes, who has been at Mossley Service Centre for two years. His work was specially meritorious as the window is small and shallow and does not lend itself easily to display.

Over eighty service centres entered for the competition. The theme this year was "Bringing Your Kitchen Up To Date," and equipment receiving special attention in the displays included electric cookers, water heaters, and washing machines. As in the past, displays had to be produced on a small budget, and were first judged on a Sub-Area basis before final Area judging by a panel comprising Board members, senior officers, and outside specialists. Sub-Area winners were Moss Side (No. 1 Sub-Area); Wigan (No. 2 Sub-Area); Blackpool (No. 4 Sub-Area); Bacup (No. 5 Sub-Area); Carlisle (No. 6 Sub-Area) and Wilmslow (No. 7 Sub-Area).

Electrical Fatalities

Giving evidence at an inquest at Bedlington, Northumberland, on a 38-year-old housewife found dead in her bathroom, a doctor said it appeared that an electric fire had slipped into the bath. The coroner, in recording a verdict of "Death by misadventure," said he could not think of anything more dangerous than having electrical appliances in a bathroom.

At an inquest at Rhyl on a 10-year-old girl who was killed when she picked up an electric wire that had broken away from a house the jury recorded a verdict of "Death by misadventure," adding that there should be more adequate supervision of overhead mains. Mr. E. W. Palmer, of Melinden, said that he saw flashes from a wire near an ash tree and went

home to get a white rag to tie at the spot to warn people off. When he returned he found the child lying on the ground with the wire clutched in her right hand. He managed to remove the wire with a brush. Mr. L. V. Taylor (Merseyside and North Wales Electricity Board) said that if the branches of the tree had been cut, generally speaking, the accident might not have happened. Wires in Meliden had last been inspected in August and he had received a report that the trees in the district had been lopped. The tree could have grown to its present height since being cut. Mr. A. H. F. Linton (Ministry of Fuel and Power) said that to insulate the neutral wires wherever they were likely to come into contact with the public would be costly. It was only the second accident of its kind.

Large Furnace Busbars

Barlow & Young, Ltd., the London engineers and contractors, have received a contract for the manufacture and supply of aluminium busbars for feeding two 7,500 kVA arc furnaces to be installed at Johannesburg, South Africa. Each phase lead will consist of sixteen 10in by ½in bars weighing a total of about 30 tons.

Calendars

The River Wye in Chee Dale makes a charming rural scene for the 1954 calendar received from the D.P. Battery Co., Ltd.

The calendar received from Brook Motors, Ltd., has three-monthly sheets each containing a picture of a well-known landmark or place of historical interest. Attention is drawn to the completion by the company of fifty years of motor manufacture.

Compressor Drives

In our issue of 27th November (page 1232) there was an item on compressors for the National Coal Board in which it was claimed that the first compressor with a flywheel type synchronous motor to be installed in Britain was now running at the Great Mountain Colliery. The British Thomson-Houston Co., Ltd., informs us that the first motors of this type driving compressors in Britain were probably those which it supplied and installed at the L.M.S. Works, Derby, in 1940. Since 1940 the company has supplied a number of similar machines for driving compressors in different parts of the world, notably Australia and India.

The company says that some compressor makers in this country insist on using a flywheel even though this is not electrically or mechanically necessary, except for use as a barring disc.

Lancashire Dynamo & Crypto, Ltd., says that it also has made motors in which the rotor is designed to have sufficient inertia to act as a flywheel; two 230 h.p., 375 r.p.m. machines of this type were supplied by the company in 1939. In addition similar synchronous motors for compressor driving have been supplied to Australia and Canada. The company says: "These machines are of course more expensive than the standard synchronous motors, but where space is an important factor, the special arrangement has the advantages which you have outlined."

Trade Announcements

With effect from 1st December **Evershed & Vignoles, Ltd.**, have taken over the responsibility for distributing the products manufactured and previously marketed by Tinsley (Industrial Instruments), Ltd. In future all correspondence in connection with Tinsley instruments should be addressed to Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick, London, W.4 (telephone: Elgar 6081).

Preston & Co. (1953), Ltd., has been formed to continue the production of all "Presto" products, with the exception of electric washing machines. The electric washing machine tools have been sold to W. H. Dean & Co., Ltd., Accrington Road, Burnley.

Mr. D. I. Davies has joined **Thorn Electrical Industries, Ltd.**, and will represent the Atlas Lighting Division in South-West Lancashire.

Best Products, Ltd., has opened a London office and showroom at 90, Regent Street, W.1 (telephone : Regent 5001/2).

The address of **Gibson, Todd & Co., Ltd.**, is now Albert Mill, Milltown Street, Radcliffe (telephone : Radcliffe 2213/4).

Clarkson (Engineers), Ltd., are building a two-bay extension to their factory at King Edward Road, Nuneaton.

Catalogues and Lists

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4.—Illustrated broadsheet and price list showing the company's comprehensive range of industrial lighting fittings and an illustrated descriptive folder on its continuous lighting trunking system for fluorescent lighting installations and telephone and power cables.

Beta Manufacturing Co., Poplar Works, Balley Road, Shipley, Yorks.—Leaflet dealing with the company's latest range of contemporary table lamps and wall brackets, together with price list.

Central Rediffusion Services, Ltd., Carlton House, Lower Regent Street, London, S.W.1.—Illustrated brochure describing the activities of the company's Industrial Communications Division.

Costs of Metering

The Influence of Legislation

At a meeting in London of the Measurements Section of the Institution of Electrical Engineers on 1st December there was a discussion on "The Influence of Legislation on the Costs of Metering" which was introduced by Mr. S. Howarth. He observed that the statutory provisions relating to electricity meters were founded on the weights and measures law which had, in abbreviated form, the following three main functions: (*a*) to establish a uniform system of units throughout the country; (*b*) to provide some system of control of weighing and measuring equipment used for trading purposes; and (*c*) to provide adequate protection to the public against short weight or measure.

Mr. Howarth showed that the control of the design of apparatus was covered by the Electric Lighting (Clauses) Act, 1899, and the Electricity (Meters) Act, 1936, which provided for the approval of meter types and testing apparatus as well as the authority for ensuring protection to the public by means of certification of meters and the appointment of impartial persons for the settlement of disputes; thus the cost of legislation to industry and the consumer was determined largely by the manner and degree of implementation.

Mr. Howarth then dealt with the position leading to the passing of the 1936 Act and showed that standards of apparatus and testing were drawn up in consultation with the National Physical Laboratory, the supply undertakings and the meter and instrument manufacturers, all requiring initial expenditure.

Overhaul and Replacement

Periodic overhaul and re-test were necessary if accuracy levels and equity were to be maintained, and the position in this respect varied from no organized changing to replacement every seven years. Discussions were taking place with a view to rationalizing the position by limiting the period of validity of certification, and the effect on costs would depend upon the relationship between the prescribed period and existing practice. It was estimated that under present conditions between one and one and a half million meters would need to be dealt with annually in order to comply with a 15 year validity period.

Summarizing, the speaker said that legislation had increased the costs of metering in varying degrees, depending on the pre-1936 arrangements. The derived benefits were improved general standards and conditions, together with an assurance of reasonable protection for the consumer.

Scope for Economies

Several following speakers in the discussion thought that money might be saved by co-ordinating testing and certification procedures, or by having less accurate metering. It was said that the average quarterly domestic bill for electricity was about £2 and cost 7s 6d to collect, owing to legislation originating in 1899 when a supply of electricity was so expensive that such incidental costs were less conspicuous. Certification, it was suggested, could be carried out more cheaply, perhaps by attendance at the manufacturer's test bench, or by the Area Boards establishing joint test stations.

The case for less refined metering questioned the need for some 16 million domestic meters to have a high accuracy at $\frac{1}{60}$th load at 0·5 power factor and dials reading to a tenth of a kWh when the kWh cost about a penny. A simple domestic charge resembling the water rate was suggested, with a meter of low accuracy to indicate excessive consumption, present levels of accuracy being thought inconsistent with the less refined methods of deciding the fixed part of the charge.

Most speakers, however, favoured accuracy, although the burden on an Electricity Board's disposable—as distinct from gross—revenue was recognized. Consumers, it was stated, desired reliable evidence of a supply which, unlike water, was invisible. The chairman stated that

an informal meeting on this subject would be held on 8th February, when Mr. Petch would open a discussion on: "Will it be possible to abolish meters entirely?"

It was noted that even with the meter limits of plus 2½ per cent and minus 3½ per cent at present stipulated, a discrepancy of 6 per cent was possible between the charges for identical consumptions. Moreover, from the supplier's point of view, a small percentage loss in revenue would cause a large percentage fall in the revenue differential, particularly as tariff structures now tended to have a smaller element of fixed charge. The imposition of close tolerances at low loads was defended as a protection for a domestic consumer whose meter was larger than he needed and such larger meters were also defended for the margin they afforded for load growth.

Day Release for Further Education

THE scientist and technologist should receive a background of education which would promote the development of the whole man as distinct from the narrow specialist, said Sir Arthur P. M. Fleming, at a Birmingham conference on 4th December. He was addressing a group of Midland business men and educationists under the auspices of the British Association for Commercial and Industrial Education (B.A.C.I.E.). The bewildering pace of technological change demanded technically trained men, and British industry could not be satisfied until every worker who had the ability to acquire technical qualifications had the opportunity to do so. In his own organization the principle of day release for further education applied to every grade of worker regardless of age, sex, or status.

Hitherto, such schemes as existed were the result of co-operation between individual employers and their local education authorities, and it was upon such voluntary efforts that we should have to rely until the appropriate clauses of the 1944 Education Act could be implemented, making day release compulsory for all at least till the age of 18. Sir Arthur appealed to employers and local authorities to provide opportunities in this way for their young employees.

Sir Hugh Chance (Chance Brothers, Ltd.) said that day release for further education, general as well as technical, should have had priority over the higher school-leaving age. Many employers encouraged technical training for apprentices, but could they afford to ignore the needs of the unskilled and semi-skilled? Small firms by co-operation among themselves could do what some large firms had done.

Councillor J. Wood, chairman, Birmingham Further Education Sub-Committee, said the city now had six centres of day continuation studies, attended by over 3,500 students.

Councillor Hewitt, Stoke-on-Trent, advocated day release from the employees' standpoint, but said there were many difficulties in the pottery industry. Boys and girls disliked what they regarded as "going back to school" after they became wage-earners, adult employees objected to working teams being broken up, and in some minds there was an unfortunate association with the days of depression, when schooling was provided as an alternative to employment.

Power Engineers' Salary Claim

AT a recent meeting in London of the National Executive Council of the Electrical Power Engineers' Association the following resolution was moved by the president, Mr. J. Jones, and carried unanimously:—

> "That immediate and drastic steps be taken to improve the status and salaries of the technical staff in the electricity supply industry."

The Association informs us that the exact extent of the claim is yet to be decided, but it can be taken for granted that the Association proposes to ask the British Electricity Authority and the Area Boards for an all-embracing salary improvement which will place the electrical power engineer in the forefront of British technologists in reward, status and opportunities.

The Executive Council of the E.P.E.A. is of the opinion that, in spite of the salary schedules negotiated since nationalization and subsequent cost of living adjustments, the salaries and prospects of the professional engineer bear a most unsatisfactory relationship to that of administrative, secretarial and accountancy staff and, in the junior technical grades, to even foremen and manual workers.

It is felt by the Association that the Electricity Boards will have difficulty in denying that a general raising of technical staff salary levels is essential to the prosperity and continuing efficiency of the industry. The electricity supply industry is becoming increasingly unattractive to engineering graduates because of the unfavourable pay and prospects.

School Electricity Supply

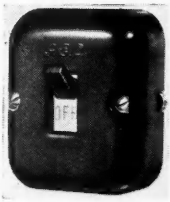
Chester City Council on 25th November rejected a recommendation of the Education Committee that £550 should be spent on converting part of the electricity supply at Overleigh School from 230 to 110 V. This school, built at a cost of about £190,000 and opened recently, has an electrical installation which cost £12,000. Ald. Matthewson said he understood the recommendation for a lower voltage supply came from a Government official, yet there were hundreds of thousands of electrical appliances operating on 230 V.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

60 A 500 V A.C. Switch

A DOUBLE-POLE all-insulated 60 A 500 V a.c. switch recently introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is available in two forms. The first, the X 1616FE, has front entry terminals and is fitted with an extended cover,



G.E.C. 60 A 500 V a.c. switch

while the other, the X 1616BE, has back entry terminals and a short cover; both forms are fitted with a connector for an earth wire and both have provision for sealing. The extended cover on the front entry switch has been introduced to comply with Regulation 404 J (I.E.E.), which requires that the stripped cable core should be covered. Both forms are moulded in high-grade phenolic plastic material.

Electric Blanket

A recent addition to the range of domestic electrical products manufactured by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, London, W.C.2, is an electric blanket. Measuring 54in by 30in, the Hotpoint blanket incorporates a 75 W element which is anchor-stitched to a cotton backing to prevent movement and ensure long life. A special woollen material, chosen for its wearing properties, is used and the blanket is bound on both sides with matching satin ribbon.

It is provided with a 9ft length of twin flexible cord and the on-off line-cord switch, finished in cream, has easy finger action and clear marking. The retail price is £6 5s 0d, plus £1 2s 10d purchase tax in the United Kingdom. Matching washable covers are available at £1 5s 0d each.

Hotpoint electric blanket

Box Type Signs

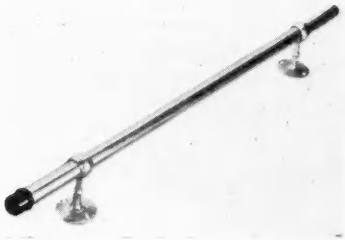
The new P-type sign made by CLAUDE-GENERAL NEON SIGNS, LTD., Pitman House, Parker Street, Kingsway, London, W.C.2, is neat, bright and reasonable in price. Running costs are low and the "Cleora" tubing used for illumination has a long life. The sign is a double sided box with the panels moulded from one piece of "Perspex." This ensures full illumination from the grid of "Cleora" sign-white tubing mounted inside.

The sign-writing is done on the inside of the panels in acrylic-based paint which is available in a wide range of colours. There is no atmospheric deterioration of the legend or of the electrical equipment which is all housed in the sign.

Overall dimensions are: length, 33in; height, 22in; depth, 5in. The box is supplied for direct wall fixing or with suspension hooks. The price is about £45 delivered and erected.

Window De-misters

The range of window de-misters made by G.B.M. (ELECTRICAL), BIRMINGHAM, 439, Moseley Road, Birmingham, 12, has been extended to cover lengths from 2ft to 7ft, and other sizes



Right: **G.B.M. window de-mister**

to special order. Both the pure copper tubes and the cast brass pedestals are heavily chromium plated, while the insulators are impervious to moisture. A 2ft 60 W unit costs £2 5s (plus £1 4s 9d purchase tax in this country), a 7ft 125 W unit £4 15s (plus £2 12s purchase tax).

Lighting Fittings

Another recent development of G.B.M. (ELECTRICAL) BIRMINGHAM, is a range of pendant lighting fittings made in three, five and seven light types suitable for either turn-up or turn-down shades. The three and five light models can also be supplied for dish type shades. One, two or three light wall brackets are available to match. The five standard finishes are matt bronze, antique brass, oxidized silver, satin silver and satin gilt. The prices range from £7 (plus £1 3s 4d purchase tax in the United Kingdom) to £15 5s 6d (plus £2 10s 11d P.T.) for the pendants and from £2 18s (plus 9s 8d P.T.) to £6 15s 6d (plus£1 2s 7d P.T.) for the wall brackets.

Another new G.B.M. line, an attractive brass lantern, is 11in high and is supplied with alternative base plates permitting it to be used either as a table lamp or as a newel post unit. The price is £2 2s 2d (plus 6s 4d P.T.).

Heated Fish Cabinet

Specially designed for fried fish caterers, the "Aljon" electrically heated display cabinet now being produced by JONES, SON & KING, 31, Haroldstone Road, London, E.17, provides not only the means of keeping cooked fish hot, but also serves as a hygienic "silent salesman."

Two 1 kW black heat elements are fitted underneath the stainless steel fish trays and the cabinet is kept at an even temperature by means of two thermostats, situated one at each end. Temperature can be controlled between 90 and 200 deg F and a "Rototherm" air temperature gauge is fitted for the users' guidance.

The cabinet, which is constructed of polished non-corrosive metal with a toughened glass front and top, measures 4ft 6in long by 2ft wide and is 1ft 4in high. Neon indicator lamps are fitted in the front plate and when in use the cabinet is illuminated by means of strip lighting fittings. The three drop-down doors at the rear are of "Perspex." Suitable for use on 200/250 V the retail price is in the region of £75.

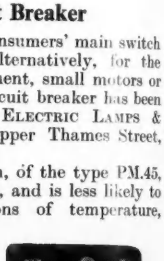
Bowl Fire

An electric bowl fire (catalogue No. 30c) announced by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., is finished in black enamel with a chromium plated copper reflector. The fire (loading 600 W) is fitted with a safety guard and 6ft of 3-core flexible is provided. It costs £2 5s 0d, plus £1 4s 9d purchase tax in the United Kingdom.

Earth Leakage Circuit Breaker

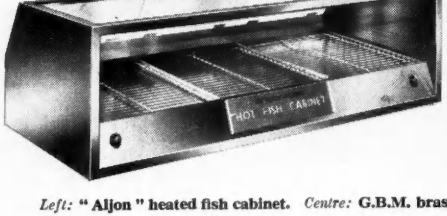
Designed for use as a consumers' main switch in small dwellings or, alternatively, for the protection of farm equipment, small motors or tools, an earth leakage circuit breaker has been introduced by SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38–39, Upper Thames Street, London, E.C.4.

The tripping mechanism, of the type PM.45, is more robust than usual, and is less likely to be affected by variations of temperature, dampness or ingress of dust. The trip coil operates at 24 V leakage potential when the armature is brought into the field of a permanent magnet which then exerts the pull tripping the switch mechanism. Provision is made for adding differential coil overload protection. Two sizes of coil are available: the 45 A standard and a 30 A alternative.



Siemens type PM.45 circuit breaker

We regret that the illustration of a illuminated bell-push in our last issue (p. 1281) was printed upside down.



Left: **"Aljon" heated fish cabinet.** *Centre:* **G.B.M. brass lantern.** *Right:* **Hotpoint electric bowl fire**

Code Convertors

Discussion on I.E.E. Radio Section Papers

THE discussion of the papers on "Telegraph Codes and Convertors" and "Code Convertors for the Interconnection of Morse and Teleprinter Systems," reported in the *Electrical Review* of 4th December, was opened by Mr. E. H. Jolley, who said that the papers covered one of the most important departures in telegraphy, particularly radio telegraphy, for many years. The 5-unit and associated codes had been developed largely as a result of the need, during the war, for a rapid expansion of communications with the Services, the choice of a code depending on the link and its method of operation. A final choice could be made only through experience and the kind of experiments which the authors had carried out. The telegraph channel could transmit far more information than the telephone circuit, and there would undoubtedly be a great development in switched telegraph, or "Telex," services.

Mr. H. H. Harrison outlined the history of the code, and said that the Western Union engineer, Angell, had cut down the 5-unit code to 2·5 time units, which was an improvement on the cable code. The problem differed from that of Cable & Wireless, in that they had a cable between this country and America, as compared with a long chain of cable stations linked by repeaters.

Electronic and Mechanical Techniques

Mr. R. D. Salmon suggested that the code convertors described included more electronic apparatus than was justified by the authors' statement and he inquired why, for the 5-unit apparatus, the authors did not employ the sending and receiving mechanism of a standard teleprinter and why they provided a distributor on the Morse code printer when the selector bars could have given the same information earlier, with a consequent saving on driving clutch, distributor and neon storage lamps.

Mr. E. Eliasen doubted whether it took longer to develop a mechanical version. With electronics no simplifications were possible as with the mechanical method. He believed the latter would compare favourably in development and tooling costs and in market price, even for a modest number.

Mr. A. Cook thought the authors had devoted too much space to the choice of a code, and he did not think Type B was so superior to Type C as they suggested. He asked whether "auto" RQ procedure would not permit of major operating economies.

Mr. H. V. Higgitt said that the same equipment might be satisfactory under one set of conditions or in one area but not under another. Redundancy was of great importance. "Now," for instance, could easily be changed into "not."

Ease of Maintenance

Mr. G. N. Davidson said that Messrs. Carter and Wheeler had made a discriminating use of the electronic technique and of cold-cathode tubes in robust and stable machines and a mechanic with little previous knowledge of electrical matters could be taught how to maintain them. Coders and decoders of the type described in the Hayton, Hughes and Saunders paper had been made at Dollis Hill and could be used as common equipment for several channels. Both cold-cathode and hard valves were used in them.

Mr. W. C. Allen said that 5-unit circuits had been running satisfactorily for some years and referred particularly to the start/stop 5-unit unprotected system, single channel, which had been running satisfactorily to New York, Moscow and Tel Aviv.

Captain C. F. Booth had no doubt that the work which had been and was being done would result in a great improvement in the reliability of overseas communications networks.

Mr. W. H. Lee suggested that redundancy should be defined differently to bring out the distinction between the different codes more clearly.

The authors briefly replied.

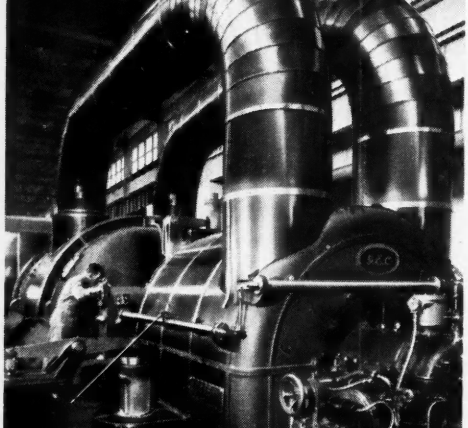
ELECTRICITY SUPPLY

Turbo-Alternator Efficiency Record

East Midlands Rural Electrification

RECENT tests have shown that two 60 MW turbo-alternator sets with hydrogen-cooled alternators at the new Uskmouth power station of the British Electricity Authority, South Wales Division, have been working at the highest efficiency ever recorded for turbo-generators of their size operating at a steam pressure of 900 lb/sq in and a steam temperature of 900 deg F. The B.E.A. has officially confirmed a heat consumption figure for these sets at full output of 9,027 B.Th.U. per kWh. The sets now in operation at Uskmouth are the first of six being supplied to the station by the General Electric Co., Ltd., the main contractors responsible for the turbine and electrical equipment for the whole of the power station plant, with the exception of the 132 kV switchgear.

One of the two G.E.C. 60 MW hydrogen-cooled turbo-alternators at the Uskmouth power station



Progress of Belfast Undertaking

Mr. R. P. Watson, the city electrical engineer and general manager, Belfast, has submitted to the Electricity Committee a report reviewing the growth of the undertaking during the past 20 years. Consumers now total 130,942, an increase of 360 per cent, while the number of kWh sold in 1952–53 was 374·2 million, an increase of more than 460 per cent. Mr. Watson says that the Belfast undertaking is unique in that it is the only municipally-owned undertaking of any magnitude in the British Isles. In the past 20 years the generating capacity has risen from 55,750 kW to 186,750 kW and the mileage of the cable system is now 2,350 against 699 in 1933.

Electricity on Farms

Speaking at a conference of secretaries and chairmen of the East Midlands branches of the National Farmers' Union held in Nottingham on 30th November, at which Sir James Turner (president of the National Farmers' Union) was present, Mr. C. R. King, chairman of the East Midlands Electricity Board, stated that since the Board took over in 1948 the number of farms taking a supply of electricity had increased by over 5,200 to a total of 16,666. This was the largest increase shown by any Electricity Board in the country. The number would have been greater but for Government restrictions on capital expenditure and shortage of materials and labour. The amount that the Board would spend on rural development in the financial year ending 31st March next, would be over £800,000 and this figure would rise to about £1 million in each of the years 1955 and 1956. He anticipated that the number of farms connected would reach 1,400 a year.

After commenting on the new standard farms tariff, Mr. King made an appeal for the increased use of electricity by farmers. Rural development was not immediately profitable to the Board and there was evidence that farms were not making anything like reasonable use, much less full use, of the service available. If farms were to be connected at the rate he anticipated,

At the N.F.U. Nottingham Conference. Left to right: Sir James Turner (president, N.F.U.), Mr. C. R. King (chairman, E.M.E.B.), Mr. J. Mould (vice-chairman, E.M.E.B.), and Mr. L. L. Perkins (chairman, East Midlands Electricity Consultative Council)

increased revenue would have to be received from them. He preferred that this should come in the form of greater consumption rather than by an increase in tariffs.

Sir James Turner congratulated the Board on its excellent work during the past five years. The example shown in co-operating with the National Farmers' Union in rural development was one which might be followed with success in other parts of the country.

Overhead Line Route

The Gloucestershire County Planning Committee has notified Cheltenham R.D.C. that it is dissatisfied with the proposed overhead power line from Melksham to Hams Hall and is preparing a case to submit to the forthcoming public inquiry. The Committee states that if the line has to cross the Cotswolds, it considers that the route now proposed is the least harmful, but it has also considered the possibility of an alternative route up the Severn Valley.

The R.D.C. Planning Committee has decided to inform the County Planning Committee that, on the assumption that it is essential for the line to be taken across the Cotswolds, it raises no objection in principle to the route proposed by the B.E.A. It supports the alternative route through the Severn Valley if the adoption of this route is reasonably practicable.

Dublin Rural Scheme Completed

Six years ago the switching on of an electricity supply at Killsallaghan, Co. Dublin, marked the beginning of the Electricity Supply Board's rural electrification scheme. Last month, when a supply was inaugurated at Naul, the scheme was completed in the Dublin county area.

Japanese Five-Year Programme

Under a five-year electric power development programme to be completed by the end of the fiscal year 1957–58 generating plant capacity in Japan is to be raised to about 16,000 MW (11,000 MW hydro-electric). In the first part of this programme, covering projects already under construction and those to be started in the current financial year (expiring in March), an effort is being made to raise capacity by 1,250 MW.

Electricity Survey

PUBLISHED last Tuesday at 1s, *The Times Electricity Supplement* brings together a vast amount of information essential to an understanding of the position of electricity in Great Britain's economy. Lord Citrine (chairman, British Electricity Authority) deals comprehensively with the policy and progress of public electricity supply. Sir Henry Self and Sir John Hacking (deputy chairmen, B.E.A.) survey, respectively, its financial prospects and the methods adopted for meeting consumers' demands. Sir John Cockcroft discusses atomic power stations and Sir David Brunt atmospheric pollution.

Other relevant subjects are district heating (Mr. Bryan Donkin), coal conservation through increased efficiency (Mr. J. D. Peattie), meeting emergencies due to plant shortage (Mr. A. R. Cooper), power station architecture (Mr. R. Furneaux Jordan), wayleaves for the grid (Mr. R. E. Wacher), Britain's fuel and energy resources (Dr. A. Parker), the 275 kV supergrid (Mr. D. P. Sayers), the cross-Channel link with France (Mr. W. B. Noddings), pumped storage and tidal schemes (Mr. H. Headland), research and development (Dr. S. Whitehead), importance of balancing the load (Mr. E. R. Wilkinson), cables for bulk power (Mr. D. T. Hollingsworth), private generating plant (Mr. W. J. Dickie), steam turbines (Mr. A. Lindley), alternators (Mr. W. S. Carfrae), electrification of railways (Mr. S. B. Warder), power in mines (Mr. J. H. Plumtre), future power supply (Mr. V. A. Pask), lighting to-day (Mr. W. R. Stevens), and the integration of European power resources (Mr. Pierre Sevette).

The views of the manufacturing industry are expressed in contributions from Sir George Nelson, Sir Harry Railing and Col. B. H. Leeson.

Financial Section

STOCKS and SHARES

PRICES of Stock Exchange securities, in both the gilt-edged and industrial markets, continue to hold their ground fairly well. At the same time activity, under the influence of wage disputes, has tended to subside further, except at isolated points where there exists what Stock Exchange members have come to call a " special situation." Examples of this are the shares of Telephone Properties, which have been the subject of violent swings ever since the sale of the operating subsidiary was first mooted; and, of course, the mad movements in Savoy Hotel shares. In the electrical group, the new transatlantic telephone project proved to be a main point of interest.

Transatlantic Cable

From the investment point of view, last week's announcement of the new transatlantic telephone cable system was taken to concern primarily the Telegraph Construction & Maintenance Co., and Siemens Brothers. They jointly own Submarine Cables, Ltd., the firm which is reported to have the responsibility of producing the necessary cable. Scheduled to be completed in three years' time, the operation is to cost £12¼ million. After the news, Telegraph Constructions rose 6d to 29s, and Siemens were quoted at 35s. On the basis of last year's distributions, the yields at these prices are around 5¾ per cent. Both companies close their annual accounts this month.

Ferranti Preference

A further half a million Ferranti 5 per cent second redeemable preference shares have been placed with the institutions and the Stock Exchange. Shares are now available in the market at 20s 6d, free of transfer stamp duty. These shares, of which a million will now be in issue, rank after the 7 per cent preference stock. Ferranti have been showing profits of around half a million, after tax, in recent years, so that the annual net cost of dividends on the second preference is calculated to be covered some fifteen times over. The company's ordinary stock remains in private hands. The new money is needed for capital expenditure in this country and in Canada.

Prices Irregular

Another week of high activity in Decca shares left the price 2s 3d to the good at 35s 9d. In the same market, E.M.I. picked up to 13s 3d. Pye deferred strengthened to 21s 3d on news of the proposed one-for-two share bonus; the directors expect to pay for the current year a dividend at a rate at least equivalent (allowing for the larger capital) to last year's. Elsewhere in the electrical markets, Chloride Electricals advanced further to 45s, and among the few other changes of any consequence were improvements in General Cable to 17s 3d and Midland Electric Manufacturing to 62s 6d. Tube Investments, 60s, Crompton Parkinson, 14s 9d, and Ward & Goldstone, 43s 6d, are a little easier. At 39s 6d, English Electrics are ex the new shares, the latter being a few pence higher. The volatile Telephone Properties have been revolving around 5¾.

Venner Development

The Venner Company's announcement in connection with the production of the first British parking meter has attracted attention to the 5s ordinary shares, which have changed hands lately at about 8s 9d. This new development had been outlined at the annual meeting a few months back, when the chairman announced an agreement with American interests for the right to make these meters and to sell them anywhere outside the American continent. Dealing with the company's trade in general at that time, he reported a record output for last year, and added that the excess profits levy was largely responsible for preventing the full benefit from reaching shareholders and the financial reserves of the business. The levy absorbed over £10,000, as compared with the net sum of under £18,000 involved in the 15 per cent ordinary dividend. On that basis, the shares yield about 8¾ per cent.

Telephone Debenture Stock

While Telephone & General Trust ordinary shares have been kept on the move by developments affecting Telephone Properties shares (in which the Trust is largely interested), the company has announced the issue of £800,000 4½ per cent debenture stock. Dealings were expected to begin this week at a price in the neighbourhood of 100. The stock is to be repaid finally at 101 in 1983, or earlier at the company's option from 1978. Particulars in the advertised statement show that the value of the company's assets is more than double the principal amount of this and the two other debenture issues which rank equally with it, and that last year's earnings covered nearly four times the combined annual interest requirements. The issue helps to alleviate a persistent dearth of first-rate redeemable securities of the kind.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 7th Dec. 1953	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Gilt-edged and Overseas Stocks							
Brit. Elec. 1968/73	3	3	90	—	3	6	8
Brit. Elec. 1974/77	3	3	89	—	3	7	5
Brit. Elec. 1976/79	3½	3½	94	—	3	14	6
Brit. Elec. 1974/79	4½	4½	104	—	4	1	9
Calcutta Elec. ..	6†	6†	19/6	+6d	6	3	0†
East African Power	7	7	22/-	—	6	7	3
Nigerian Elec. ..	10	10	24/6	—	8	3	4
Palestine Elec. "A"	Nil	Nil	17/6	−1/9		Nil	
Perak Hydro-Elec.	Nil	6	14/6	−6d	8	5	6
Equipment and Manufacturing							
Aberdare Cables (5/-)	20	25	8/6	—	7	7	0*
Aerialite (1/-) ..	88½	88½	9/9	—	9	1	3
Allen, W. H. ..	15	15	50/-	—	6	0	0
Aron Elec. Ord. ..	15	20	42/6	—	9	8	2
Assoc. Elec. Ord.	20	20	42/6	—	4	14	3*
Automatic Tel. & El.	15	15	62/6	—	4	16	0
Babcock & Wilcox	18	18	47/6	+6d		—	
Baldwin, H. J. (2/-)	20	20	4/-	—	10	0	0
Bakelite (10/-) ..	—	12½	21/-	—	5	4	3
British Aluminium	12	12	37/-	—	6	9	8
B.I. Callender's ..	9	10	39/-	—	5	2	6
British Thermostat (5/-)	30	35	18/9	—		—	
British Vac. Cleaner (5/-)	25	25	12/9	—	9	16	0
Brook Motors (10/-)	20	20*	35/-	—	5	14	3
Brush Ord. (5/-) ..	10	4	4/3	—		—	
A. F. Bulgin (1/-)	30	30	3/3	—	9	4	6
Burco (5/-) ..	35	35	23/3	—	7	10	6
Chloride El. Storage	15	20	45/-	+1/6	4	9	0*
Cole, E. K. (5/-) ..	25	25*	21/6	+3d	5	16	3
Cossor, A. C. (5/-)	10	10	7/-	—	7	2	10
Crabtree (10/-) ..	17½	17½	25/-	—	7	0	0
Crompton Parkinson Ord. (5/-) ..	11¼	20	14/9	−3d	6	15	7
De La Rue (5/-) ..	35	Nil	11/3	—		—	
Decca (5/-)	112½	150	35/9	+2/3	4	4	0*
Dewhurst (2/-) ..	19	19	6/6	—	5	17	0
Dictograph Tel. (2/-)	20	20*	5/6	—	7	5	6
E.M.I. (10/-) ..	12	8	13/3	+6d	6	0	9
Electrical Components (5/-) ..	20	20	11/-	—	9	1	10
Elec. Construction	15	15	53/9	—	5	11	9
Enfield Cable Ord.	7½	5	18/9	—	5	6	8
English Electric ..	15	15	39/6xr	—		—	
Ericsson Tel. (5/-)	22†	22*†	45/6	—	2	8	4†
Ever Ready (5/-) ..	35	35	28/-	—	5	5	0
Falk Stadelmann	15	15	40/-	−1/3	7	10	0
G.E.C. Ord. ..	22½	11¼*	40/-	—	5	12	6
General Cables (5/-)	30	30	17/3	+6d	8	14	0
Greenwood & Batley	15	17½	40/9	—	8	11	9
Hackbridge Cable (5/-)	20	20	12/3	−6d	8	3	3
Hackbridge Hewittic (5/-)	20	20	17/6	—	5	14	3
Hall Tel. Acc. (10/-)	10	10	12/-	—	8	6	8
Heatrae (2/-) ..	12½	12½	4/-	—	6	5	0
Henleys (10/-) ..	20	10½*	17/6	—	6	0	0
Holophane (5/-) ..	20	20	13/-	—	7	13	10
Hoover (5/-) ..	35	25	25/3	—	4	19	0

Company	Dividend Previous	Dividend Last	Middle Price 7th Dec. 1953	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Equipment and Manufacturing (continued)							
Intl. Combustion (5/-)	25	15*	15/-	—	5	0	0
Johnson & Phillips	15	15	50/-	—	6	0	0
Lancashire Dynamo	12½	12½	46/3	+2/-	5	7	9
Laurence, Scott (5/-)	15	15	13/9	−6d	5	9	1
London Elec. Wire	12½	15	75/9	—	3	19	3
J. Lucas	9½	10½	48/9	—	4	8	9
Marryat & S. (2/-)	22½	22½	5/9	—	7	16	6
Mather & Platt ..	12½	15	53/6	+6d	5	12	3
Metal Industries ..	15	12*	38/-	−6d	6	6	4
Mid. Elec. Mfg. ..	15	15	62/6	+1/3	4	16	0
Murex	15	15	51/6	−6d	5	16	6
Newman Ind. (2/-)	10	10	2/6	—	8	0	0
Oldham & Son (1/-)	35	17½*	2/6	—	7	0	0
Parnall (Yate) (5/-)	6	6	4/1½	—	7	5	5
Parsons, C. A. ..	10*	12½	36/3	—		—	
Plessey (5/-) ..	25	30	31/6	—	4	15	3
Pye Deferred (5/-)	18	20	21/3	+3d	4	14	1
Revo (10/-) ..	27½	27½	17/-	−3d		—	
Reyrolle	10*	12½	62/6	—		—	
Scot. Cable (4/-) ..	32	20*	13/-	—	6	3	0
Siemens Ord. ..	10	10	35/-	—	5	14	3
Southern Areas ..	5	6	19/-	—	6	6	4
Strand Elec. (5/-) ..	17½	17½	7/9	—	11	5	6
Sturtevant (5/-) ..	17½†	18·1*†	29/-	—		—	
Sun Elec.	15	15	25/-	—	12	0	0
Switchgear & Cowans (5/-)	22½	22½	13/6	−3d	8	3	9
Taylor, T. (5/-) ..	20	25	22/6	—	5	11	0
T.C.C. (10/-) ..	20	20*	42/6	—		—	
T.C. & M. ..	10	8½*	29/-	+6d	5	17	3
Telephone Mfg. (5/-)	10	10	7/9	—	6	9	0
Thorn Elec. (5/-) ..	10	12½	13/-	—	4	16	2
Tube Investments	15*	15	60/-	−1/-	5	0	0
Vactric (5/-) ..	Nil	Nil	8/9	—		Nil	
Veritys (5/-) ..	7½	10	4/6	—	11	2	2
Walsall Conduits (4/-)	70	70*	44/6	−6d	6	5	10
Ward & Goldstone (5/-)	45	45*	43/6	−1/-	5	3	5
Watford (2/-) ..	25	25	5/-	−3d		—	
Westinghouse Brake	14	15	62/-	—	4	16	9
West, Allen (5/-) ..	15	15	13/3	—	5	13	2
Trusts, Transport and Communications							
Anglo-Am. Tel.: A. Ord.	—	6	86½	—	6	18	9
Ord.	—	3¾	57½	—	6	10	5
Anglo-Portuguese	8	8	22/3	—	7	3	9
Brit. Elec. Traction: Def. Ord. (5/-) ..	25	35	37/-	+6d	4	14	7
Cable & Wireless: Ord.	8	8	144	—	5	11	1
4% Loan ..	4	4	97	—	4	2	6
Calcutta Trams ..	6†	2½†	18/9	—		—	
Cape Elec. Trams	5½	5½	11/-	+1/-	10	0	0
Marconi Marine ..	10	10	28/9	—	6	19	2
Oriental Tel. Ord.	16	16	72/6	—		—	
Telephone Props.	8	8	5¾	—		—	
Tele. Rentals (5/-)	10	10*	10/-	—	5	0	0

* After capital bonus. † Dividends are paid free of income tax.

The above quotations are based upon the middle prices given in the Stock Exchange Daily Official List.

REPORTS and DIVIDENDS

Heenan & Froude, Ltd.—In his circulated review of the activities of the group for the year ended 29th August last, Mr. C. L. Hill (chairman) says that the output of the group was in excess of the previous year, but rising costs of manufacture have reduced profit margins. Although orders on the books of the group at the end of the year were some £900,000 less than at the same time last year, the balance stood at about £4,400,000. Dealing with the activities of the various sections of the group, Mr. Hill says that in the electronics section, which is responsible for the electronic equipment incorporated in couplings and dynamatic dynamometers, the first production model of radio control apparatus has been built and is undergoing tests under working conditions. Mr. Hill's review concludes with references to the subsidiary companies.

Ferranti, Ltd., has placed privately the remaining £500,000 of the 5 per cent second redeemable cumulative preference stock at 20s 3d. This brings the total second preference in issue up to the authorized amount of £1,000,000. The proceeds are to be used for capital expenditure in the United Kingdom and Canada. The company intends to spend £700,000 on modernization of factories and plant in the United Kingdom. Expenditure by the Canadian subsidiary is estimated at $2.5 million and Treasury approval has been obtained for remitting the dollars.

The English Electric Co., Ltd.—At the extraordinary general meeting held on 3rd December resolutions to increase the capital of the company to £15,000,000 and to authorize the issue to ordinary stockholders of one new fully paid ordinary share for every £2 ordinary stock held were duly passed.

Pye, Ltd., is holding an extraordinary meeting on 21st December at which proposals will be submitted to create 1,400,000 "A" 5s deferred ordinary shares and to make a scrip issue. Application has been made to the Treasury for consent to the issue. It is intended to capitalize reserves amounting to £317,303 17s 6d and to issue one new "A" deferred ordinary share for every two 5s units of deferred ordinary stock held.

Scottish Cables, Ltd., has declared an interim ordinary dividend of 7½ per cent (unchanged).

Vent-Axia, Ltd., has declared an interim dividend of 25 per cent (unchanged).

Solus Teoranta (the Irish lamp making concern) has announced a final dividend of 7½ per cent, making 12½ per cent for the year (unchanged).

George Kent, Ltd., has announced an interim dividend of 3 per cent (same) on increased capital.

New Companies

Weatherheads (Woburn Sands), Ltd.—Registered 10th November. Capital £2,000. Manufacturers, repairers and dealers in electrical and mechanical apparatus and accessories and in particular radio sets, etc. Directors: H. C. Weatherhead and Mrs. Gladys L. M. Weatherhead. Secretary: H. C. Weatherhead. Regd. office: 2, Aspley Hill, Woburn Sands, Bletchley.

High Voltage Servicing Co., Ltd.—Registered 5th November. Capital £1,100. Manufacturers, servicers and maintainers of high voltage generators, etc. Directors: A. E. Knight, T. B. Fox and L. A. Clemence. Regd. office: Langston Road, Debden Estate, Loughton, Essex.

Roburt Electrical Engineers & Contractors, Ltd.—Registered 5th November. Capital £100. Electrical engineers and contractors, etc. The first directors are to be appointed by the subscribers. Regd. office: 10, Greenland Street, Islington, N.1.

Gillone Electric, Ltd.—Registered 3rd November. Capital £1,000. Electrical contractors, manufacturers and dealers in television, radio and electrical components, etc. Directors: G. D. Gilbert and A. L. Leeson. Secretary: G. D. Gilbert. Regd. office: Rockstone Works, Rosemary Lane, Camberley, Surrey.

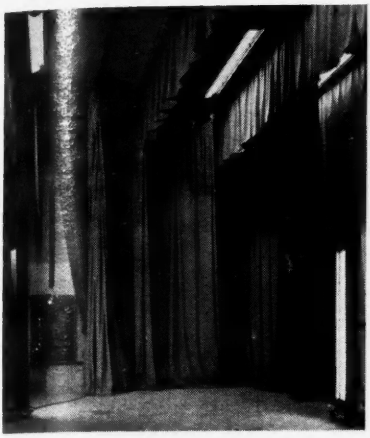
Bankruptcies

W. Heywood, 13, Miller Road, Oldham, Lancs, electrical engineer.—Receiving order made 26th November on debtor's own petition.

M. J. Haine and **M. E. Simpson**, trading as Haine & Co., 77, Westbourne Grove, W.2, electricians.—Trustee, Mr. F. H. Langmaid, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver, released 25th November, 1953.

J. H. Coupland, 85, Northgate, Canterbury, carrying on business under the style of E. J. Ratcliff, electrical engineer.—Trustee, Mr. A. M. Lander, 1, The Parade, Canterbury, Official Receiver, released 30th November, 1953.

R. Jackson, lately carrying on business at 38, Walley Range, Blackburn, electrician.—Last day for receiving proofs for dividend 19th December. Trustee, Mr. D. Atkinson, 14, Lowther Street, Carlisle, Official Receiver.



Thorn stage lighting installation at Duthy Hall, Southwark

Stage Lighting

ON 28th November, before a distinguished audience, the newly decorated Duthy Hall, Southwark, was officially inaugurated by the performance of a programme of literary and musical works, under the auspices of the Southwark Council Festival Committee. As in all such buildings, accommodation in the wings of the stage is severely limited but the most has been made of available space in this case by the introduction of the new "Atlas" remote control system of lighting. The stage lighting consists of eleven three-colour fluorescent stage fittings, four 1,000 W front of house spots and two 500 W stage spots. Three of the fluorescent fittings are used in each of the two batten rows and a further three in a cyclorama ground row. The remaining two are mounted on stands as wing floods controlled from dip boxes.

The motorized dimmers for both tungsten filament and fluorescent lighting are enclosed, with fuses, relays and chokes, in sheet steel housing in a passageway to the left of the stage and are controlled from a flush panel on the wall in the wings. Each tube and tungsten filament spotlight has its own dimming circuit and these are so grouped as to give the utmost flexibility of control. Colour master switches give the operator a choice of "full up" or dimming positions and pilot lamps on the control panel enable the degree of dimming to be pre-set. Auditorium lighting is also controlled from the same panel.

The whole installation was designed and constructed by Thorn Electrical Industries, Ltd., and was installed by Messrs. W. Frizell of 14, Camberwell Road, S.E.5.

Rural Wales

A WHITE Paper with this title (Cmd. 9014, H.M. Stationery Office, 6d) was published last week. It gives the Government's views on the second report by the Rural Development Panel of the Council for Wales and Monmouthshire. The primary recommendation of the Panel was that a sum of £60 million should be allocated for the purpose of rehabilitating and developing the Welsh rural areas and administered by a specially-appointed Corporation. Electrical development was mentioned as one branch of activity which the Corporation should assist.

The Government says that although it is in sympathy with the broad aims indicated by the Panel it cannot agree that the way to set about the task is to subsidize the economy still further. Dealing specifically with electricity service, the Government recognizes the need for an improved supply but considers that there is a physical limit to the rate at which electricity can be made available in remote rural areas, and other parts of the country have as strong claims as the rural areas of Wales.

"The Electricity Boards serving Wales have made good progress since they assumed responsibility, and their plans provide for a steady increase in electrification in Wales which will ultimately bring electricity within reach of all but the most isolated farms and villages. The British Electricity Authority has aided the Boards in their task by its substantial capital investment in the extension of main transmission lines and the addition of new grid points of supply. In June, 1953, the Minister of Fuel and Power announced that the capital investment permitted to the Electricity Boards would be increased by £1½ million over the succeeding 18 months so that the Boards might accelerate their progress with rural development schemes throughout the country, and rural Wales will benefit proportionately from the increase."

Electrical Industries Club

THE General Committee of the recently-formed Electrical Industries Club held its first meeting on 27th November. Mr. A. B. Wildsmith, director of the Electrical Wholesalers' Federation, was elected chairman of the Club for the ensuing year, and Mr. R. Baldwin, editor, *Electrical Times*, vice-chairman. The draft rules and regulations of the Club were amended and approved, and the secretary was instructed to proceed with the arrangements for the necessary printing.

It was agreed that meetings should be held on the second Tuesday of each month, commencing on 12th January, when the founder-members would be invited to bring along prospective members as their guests. After the meeting the Committee was entertained to luncheon at Kettner's by Sir John Dalton.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the* Electrical Review *clearing house, Room 231, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 14th December

BIRMINGHAM.—Midland Hotel, 6.15 p.m. Birmingham Electric Club. Extraordinary general meeting, followed by "Transformers—Modern Trends," by R. M. Charley.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre. "The Technique and Development of Automatic Winding in Mine Shafts," by B. L. Metcalf and G. Cuttle.

CHESTER.—Town Hall, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Electricity in Farm Crop-Drying," by C. A. Cameron Brown and P. G. Finn-Kelcey.

LEEDS.—24, Aire Street, 6.15 p.m. I.E.S. Leeds Centre. "Manufacturing Methods of Producing Lighting Fittings," by G. S. H. Mogford.

LEICESTER.—Electricity Offices, Charles Street, 7 p.m. Leicester Electrical Society. "Television," by D. Jackson.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Discussion on "Will Transistors Oust Receiving Valves?" opened by E. H. Cooke-Yarborough.

St. Ermin's Hotel, Caxton Street, S.W.1, 7 p.m. A.S.E.E. Central London Branch. "Oil Refining" (illustrated), by Mr. A. W. W. Kirby.

NEWCASTLE-UPON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "The Testing and Specification of Bushings in Relation to Service Conditions," by H. Barker and H. Davies.

King's College, 6.30 p.m. Institute of Fuel, North-Eastern Section. Discussion on "Domestic Heating," opened by J. S. Hales and Miss Mary Leigh. (Ladies' Night—informal dinner to follow.)

NORTHAMPTON.—Franklins Gardens Hotel. Institution of Works Managers, Northampton Branch. Annual dinner.

SHEFFIELD.—Livesey Clegg House, 7.30 p.m. Junior Institution of Engineers, Sheffield and District Section. "Some Aspects of Railway Electrification," by W. D. Sheers.

Tuesday, 15th December

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "Voltage Transformers and Current Transformers associated with Switchgear," by W. Gray and A. Wright.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Centre. Discussion on "Some Criticism of Technical Education," opened by G. A. Haigh and G. Auton. (Joint meeting with Students' Section.)

LIVERPOOL.—North Wales Electricity Board's Service Centre, Whitechapel, 6 p.m. I.E.S. Liverpool Centre. "Home Lighting," by Miss M. D. Wardlaw.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. "A High-Voltage Laboratory," by R. E. James.

2, Savoy Hill, 6.30 p.m. Association of Supervising Electrical Engineers. "Radio and Television Servicing," by A. J. Lillicrap.

Manson House, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "Sectional Paper Machine Drives with Electronic Control," by T. E. Barany.

OLD PORTSMOUTH.—B.E.A. Conference Rooms, High Street, 7.30 p.m. A.S.E.E. Portsmouth Branch. "Power Factor Improvement Equipment," by Mr. Hawkins.

WOLVERHAMPTON.—Star and Garter Royal Hotel, 7 p.m. Institution of Works Managers' Wolverhampton Branch. "Costing as an Aid to Management," by H. H. Norcross.

Wednesday, 16th December

GLASGOW.—425/427, Sauchiehall Street, 7 p.m. Incorporated Plant Engineers, Glasgow Branch. "Application of Fuel Oils," by P. Wilson.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "Some Design Features of the Semi-Outdoor Power Station at Ince," by F. H. S. Brown.

Manson House, Portland Place, W.1, 7.30 p.m. Institute of Welding, North London Branch. "The Application of the Self-Adjusting Arc," by P. T. Houldcroft. (With film.)

32, Worple Road, Wimbledon, 8.15 p.m. A.S.E.E. South West London Branch. "Principles of Ductube" (illustrated), by H. J. Huggins.

MANCHESTER.—Engineers' Club, Albert Square, 7.30 p.m. A.S.E.E. Manchester Branch. Chairman's Night.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institution, Corporation Road, 6.30 p.m. I.E.S. Tees-Side Group. "Road Vehicle Lighting," by K. J. Jones.

NOTTINGHAM.—E.M.E.B., Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. "Transformer and Lubricating Oils," by L. G. Chatterley.

PRESTON.—19, Friargate, 7.30 p.m. I.E.S. North Lancashire Group. "Fluorescent Stage Lighting," by Dr. H. H. Ballin. (Joint meeting with Preston Branch of the A.S.E.E.)

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "Resistance Heating of Mild Steel Containers at Power Frequencies—Conductive Heating of Pipes and Inductive Heating of Vessels," by C. A. M. Thornton.

STAFFORD.—At the English Electric Co.'s Lecture Theatre, 7 p.m. I.E.E. North Staffs Sub-Centre Students' Section. "Cold Strip Mills," by J. T. Jones.

STOCKTON-ON-TEES.—Vane Arms Hotel, 7.30 p.m. Institution of Works Managers, Tees-side Branch. Discussion on "Management, Trade Unions and Productivity."

Thursday, 17th December

BLACKBURN.—Grosvenor Hotel, Lord Street, 7.30 p.m. Incorporated Plant Engineers, Blackburn Branch. "Hydraulics in Industry."

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Servo Systems," by L. B. D'Alton.

EDINBURGH.—North British Hotel, 7 p.m. Institute of Fuel, Scottish Section. Discussion on "Training in Fuel Technology," between Principal H. B. Nisbet, C. W. Marshall and W. G. Marskell.

LONDON.—164, Shaftesbury Avenue, W.C.2, 7 p.m. Television Society. "Information Theory and Television," by Dr. E. C. Cherry.

Caxton Hall, Westminster, 2.30 p.m. Diesel Engine Users' Association. "Report on Heavy Oil Engine Working Costs and Performance, 1952," and informal discussion on "Operating Problems."

SOUTHAMPTON.—Polygon Hotel, 7 p.m. for 7.30 p.m. I.E.E. Southern Centre. Annual dinner and dance.

Friday, 18th December

BIRMINGHAM.—Imperial Hotel, 7.30 p.m. Incorporated Plant Engineers, Birmingham Branch. "Industrial Safety," by E. E. Jellife.

LONDON.—Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. "The New British Standard System of Limits and Fits," by H. G. Conway and "The Practical Application of the New British Standard System of Limits and Fits," by G. J. Pearmain.

STAFFORD.—Technical College, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "The Co-ordination of Insulation of High Voltage Electrical Installations," by J. S. Cliff.

Saturday, 19th December

LEEDS.—Riley Smith Hall, Leeds University, 8 p.m. I.E.E. North Midland Students' Section. Joint dance with the Institutions of Mechanical and Civil Engineers.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 20th January, from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

13209. Garton, H. W.—Electrical mechanical counter. 19th December, 1951. (702591.)

23516. Electric & Musical Industries, Ltd.—Magnetic sound recording or reproducing apparatus. 22nd August, 1950. (702662.)

32844. Wartsila-Yhtyma O/Y-Wartsila-Koncernen Aktiebolag.—Electric supply installations. 22nd December, 1949. (702451.)

1950

10589. Electric & Musical Industries, Ltd.—Radio antennas. 25th April, 1951. (702525.)

15516. General Electric Co., Ltd., and Dauncey, L. A.—Mounts for seed crystals for use in crystal-growing apparatus. 15th June, 1951. (702526.)

17555. Philips Electrical Industries, Ltd.—Luminescent materials and electric discharge tubes containing such materials. 13th July, 1950. (702527.)

21602. Marconi's Wireless Telegraph Co., Ltd.—Saw tooth wave circuits. 4th July, 1951. (702742.)

26085/6. Beresford & Son, Ltd., J., and Smith, S. A.—Manufacture of stators for electric motors. 27th September, 1951. (702499/500.)

28961. Woodall-Duckham Vertical Retort and Oven Construction Co. (1920), Ltd.—Centrifugally operated electric switches. 27th November, 1951. (702532.)

29079. Philips Electrical Industries, Ltd.—X-ray apparatus. 28th November, 1951. (702462.)

31160. Salvador, M. M.—Switch for operating electric hooters or horns of motor vehicles. 21st December, 1950. (702536.)

1951

406. Pye, Ltd.—Cameras, particularly television cameras. 7th January, 1952. (702600.)

2454. General Electric Co., Ltd., and Gardiner, M.—Coaxial electric cable junction boxes and coaxial electric cable assemblies. 13th March, 1952. (702475.)

2636. Unschuld, H. M.—Apparatus for the treatment of fluids with electrical discharges. 2nd February, 1951. (702758.)

3237. Stone & Co. (Deptford), Ltd., J.—Electromagnetic cut-in switchgear for electrical generating equipment. 22nd January, 1952. (702542.)

3599. G.M. Engineering (Ottery St. Mary), Ltd.—Electrical power distribution systems. 28th January, 1952. (702463.)

3761. Electric & Musical Industries, Ltd.—Scanning circuits for cathode-ray tubes. 31st January, 1952. (702674.)

4750. Reyrolle & Co., Ltd., A.—Tapping switches for electric relays. 27th February, 1952. (702543.)

5114. Standard Telephones & Cables, Ltd.—Crystal triodes. 2nd March, 1951. (702544.)

6155. British Thomson-Houston Co., Ltd.—Lanterns. 10th March, 1952. (702765.)

6564. Franco-British Electrical Co., Ltd., and Brackenbury, A. H.—Lighting fittings. 19th March, 1952. (702677.)

9400. Igranic Electric Co., Ltd.—Electric motor devices for printing presses. 23rd April, 1951. (702603.)

10462. Ashley Accessories, Ltd.—Electrical junction boxes. 23rd April, 1952. (702553.)

10497. English Electric Co., Ltd.—Corner vane elements, for example, for diffusers in radial flow compressors 25th April, 1952. (702773.)

10599. Electric & Musical Industries, Ltd.—E.h.v. supply circuits for television viewing tubes. 30th April, 1952. (702604.)

10657. British Optical & Precision Engineers, Ltd.—Electrode construction of electroscopes. 25th April, 1952. (702605.)

10801. Pittsburgh Plate Glass Co.—Electro-conductive products and production thereof. 8th May, 1951. (702774.)

10929. Cox, J. E.—Electric insulators. 8th May, 1952. (702608.)

13138. National Research Development Corporation.—Cathode-ray polarographic apparatus. 28th May, 1952. (702685.)

15990. Hazeltine Corporation.—Control apparatus for television receivers. 5th July, 1951. (702477.)

16663. Standard Telephones & Cables, Ltd.—Electrical pulse supply. 13th July, 1951. (702692.)

17164. Rheolaveur General Construction, Ltd., and Robson, E. B.—Float-operated electric control mechanism for coal-washing plant. 21st July, 1952. (702482.)

17548. Marconi's Wireless Telegraph Co., Ltd.—Phase monitoring circuit arrangements. 29th May, 1952. (702693.)

20117. Lucas (Industries), Ltd., J.—Electricity generating and storage systems for road vehicles. 12th August, 1952. (702612.)

20203. Saunders-Roe, Ltd., and Jackson, P. G. S.—Apparatus for ultrasonic signalling. 25th June, 1952. (702567.)

20372. English Electric Co., Ltd.—Electromagnetic relays. 22nd August, 1952. (702790.)

21397. Mond Nickel Co., Ltd.—Welding electrodes. 11th September, 1951. (702697.)

22724. General Electric Co., Ltd., and Miles, E. E.—Thermionic cathodes. 29th September, 1952. (702615.)

23044. General Electric Co., Ltd., and Jones, D. D.—Junction devices for three or more electrical transmission lines. 3rd October, 1952. (702568.)

23221. Centre National de la Recherche Scientifique.—Electrostatic machines. 5th October, 1951. (702494.)

24102. British Thomson-Houston Co., Ltd.—Packaging of a plurality of small articles. 27th August, 1952. (702617.)

25094. Standard Telephones & Cables, Ltd.—Dry contact rectifiers. 17th October, 1952. (702620.)

25506. Siemens & Halske Akt.-Ges.—Loudspeaking telephone installations. 31st October, 1951. (702571.)

26266. Nettle Accessories, Ltd., and Garner, J. A.—Electric plugs. 10th November, 1952. (702501.)

26941. Aktiebolaget Iggesunds Bruk.—Electric melting furnaces. 16th November, 1951. (702799.)

27081. Philips Electrical Industries, Ltd.—Electric-discharge tubes. 19th November, 1951. (702504.)

27810. General Electric Co., Ltd., and Feltham, A. R.—Circuit arrangements for operating cathode-ray tubes. 26th November, 1952. (702802.)

28522. British Thomson-Houston Co., Ltd.—Transparent luminescent screens. 5th December, 1951. (702575.)

30217. Hazeltine Corporation.—Colour-television electro-optical apparatus. 27th December, 1951. (702712.)

30314. Radio Corporation of America.—Colour television receivers. 28th December, 1951. (702627.)

1952

728. Decca Record Co., Ltd.—Switches for radio frequency signals. 14th October, 1952. (702630.)

1536. Landis & Gyr Akt.-Ges.—A.c. meters. 18th January, 1952. (702717.)

1765. British Thomson-Houston Co., Ltd.—Moulded articles from thermoplastic resins. 22nd January, 1952. (702581.)

1775. Chase-Shawmut Co.—Current-limiting electric cartridge fuses. 22nd January, 1952. (702582.)

3040. Siemens Schuckertwerke Akt.-Ges.—Casings for electrical appliances and devices, more especially connecting sleeves or end seal sleeves for electric cables. 5th February, 1952. (702583.)

4532. Marconi's Wireless Telegraph Co., Ltd.—Frequency discriminator circuit arrangements. 30th September, 1952. (702721.)

5130. Licentia Patent Verwaltungs-Ges.—Gas-blast electric circuit breaker. 27th February, 1952. (702509.)

6856. Svenska Aktiebolaget Gasaccumulator.—Light responsive devices for controlling electrical circuits. 17th March, 1952. (702588.)

8001. Standard Telephones & Cables, Ltd.—Dry contact rectifiers. 28th March, 1952. Addition to 697269. (702725.)

9308. Soc. Alsacienne de Constructions Mécaniques.—Systems of telecommunication employing coded pulse groups. 10th April, 1952. (702638.)

13148. Philips Electrical Industries, Ltd.—Circuit arrangements comprising an ionization tube. 23rd May, 1952. (702644.)

17000. Norddeutsche Seekabelwerke Akt.-Ges.—Electric cables, more particularly submarine cables. 7th July, 1952. (702652.)

22036. Standard Telephones & Cables, Ltd.—Radio navigation. 2nd September, 1952. (702654.)

23584. British Thomson-Houston Co., Ltd.—Street lighting lanterns. 19th September, 1952. Addition to 670840. (702655.)

23703. Standard Telephones & Cables, Ltd.—Electrical cross-connecting frames. 22nd September, 1952. (702656.)

26274. Hoganas-Billesholms Aktiebolag.—Magnetic separators. 20th October, 1952. (702729.)

28385. Philips Electrical Industries, Ltd.—Device for magnetic recording and/or reproduction. 11th November, 1952. (702730.)

1953

4412. Pirelli Soc. per Azioni.—Electric cables. 17th February, 1953. (702660.)

12510. Landis & Gyr Akt.-Ges.—A.c. meters. 18th January, 1952. Divided out of 702717. (702738.)

SIX MONTHS' CANADIAN IMPORTS

CANADIAN imports of electrical goods during the first half of 1953 showed an increase of over 50 per cent in value on January–June, 1952, and totalled $97,750,000. The accompanying table shows some of the principal items with notes of increases or decreases on the corresponding period of 1952. It will be seen that the only noteworthy decline was in telephone apparatus, while an outstanding advance took place in power plant. In the face of competition from the United States and several countries of Continental Europe, the share of the United Kingdom was maintained, except in the larger motors. Switzerland was fairly well represented in special steam generators, motors over $10, switchboards, transformers, rheostats, controllers and meters; West Germany obtained business in generators, motors over $10, and a small number of meters; Sweden also in some power plant; the Netherlands in radio goods; and Hongkong in lamps of the smaller kinds and lighting fixtures. For these items from the Continent comparative figures are not available.

Class of Goods	Jan.–June, 1953 $ (000)	Inc. or dec. $ (000)
Batteries, storage	590	+ 141
From United Kingdom	68	+ 43
,, *United States*	520	+ 96
Dynamos and parts	5,308	+ 1,036
From United Kingdom	641	+ 223
,, *United States*	4,626	+ 776
Electric meters	780	+ 30
From United Kingdom	87	— 1
,, *United States*	678	+ 29
Motors valued at less than $10	232	+ 31
From United Kingdom	20	—
,, *United States*	200	+ 32
Motors, other, and parts	8,293	+ 135
From United Kingdom	1,110	— 343
,, *United States*	6,989	+ 499
Rheostats, controllers, etc.	4,274	+ 387
From United Kingdom	180	+ 15
,, *United States*	4,065	+ 398
Transformers and parts	1,994	+ 198
From United Kingdom	559	+ 25
,, *United States*	1,400	+ 294
Switchgear for use in coal mines	64	— 10
From United Kingaom	43	+ 4
,, *United States*	22	— 13
Switches, switchboards, etc.	5,294	+ 465
From United Kingdom	609	+ 229
,, *United States*	4,558	+ 371

Class of Goods	Jan.–June, 1953 $ (000)	Inc. or dec. $ (000)
Telegraph apparatus	2,384	+ 792
From United Kingdom	259	+ 163
,, *United States*	2,124	+ 637
Radio sets and other radio apparatus (excluding valves) n.o.p.	19,364	+ 9,867
From United Kingdom	1,453	+ 463
,, *United States*	17,715	+ 9,165
Telephone apparatus	4,158	+ 341
From United Kingdom	1,040	+ 290
,, *United States*	3,106	+ 59
Electric steam generators and parts of a kind not made in Canada	4,250	+ 3,591
From United Kingdom	3,873	+ 3,400
,, *United States*	70	+ 22
Electric precision instruments	2,159	+ 526
From United Kingdom	84	+ 20
,, *United States*	2,011	+ 487
Torchlights, flashlights, side and tail lights	545	+ 103
From United Kingdom	29	+ 5
,, *United States*	429	+ 56
Lighting fixtures and appliances	2,736	+ 667
From United Kingdom	59	+ 44
,, *United States*	2,573	+ 659

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—BRISBANE.—12th February. City Council. 3,000 electricity meters. (E.S.B. 10175/53. Ten/7669.)*

Belfast.—17th December. Education Department. Electrical installation in Ballygolan primary school, Serpentine Road. Education Architect's Department, Education Offices, Academy Street.

Carlow.—7th January. Mental Hospital Board. Electrical installation at mental hospital. N. Mathews, consulting engineer, 42, Fitzwilliam Place, Dublin.

Denbighshire.—11th January. County Education Authority. Electrical installations in primary schools. (See this issue.)

Finsbury.—9th January. Borough Council. Electric lamps for one year. Borough engineer, Finsbury Town Hall Annexe, Rosebery Avenue, London, E.C.1.

India.—TRIVANDRUM.—16th December. Stores Purchase Committee, Government of Travancore-Cochin. Time switches. (E.S.B. 10692/53. Ten/7659.)*

BOMBAY.—28th January. Controller of Stores, Electricity Supply and Transport Undertaking. H.v. and l.v. circuit breakers. (E.S.B. 10681/53. Ten/7675.)*

ANDHRA.—26th December. Government Department of Electricity. 425 distribution transformers (25-100 kVA). (E.S.B. 11197/53. Ten/7713.)*

Liverpool.—16th January. City Council. Four sets of sewage pumps (16in and up). City engineer, Municipal Buildings, 2.

Market Harborough.—18th January. U.D.C. Overhead lines and underground cable in connection with waterworks extension. (See this issue.)

Morecambe and Heysham.—30th December. Town Council. Electrical installations in 51 housing units. Borough surveyor.

Newbiggin (Northumberland).—29th December. U.D.C. Electrical installations in 20 houses, Welfare Crescent. Surveyor, Council Offices.

New Zealand.—WELLINGTON.—18th January. Post and Telegraph Department. Radio valves and switches. (E.S.B. 10938/53. Ten/7708.)*

26th January. Telephone equipment. (E.S.B. 10935/53. Ten/7707.)* 27th January. Fluorescent lamp starters. (E.S.B. 10940/53. Ten/7706.)* 2nd February. Crystal diodes and valves. (E.S.B. 10939/53. Ten/7704.)*

South Africa.—JOHANNESBURG.—7th January. Stores Department, South African Railways. Five electrically heated, thermostatically controlled, pot type, metal melting furnaces. (E.S.B. 10601/53. Ten/7664.)* Air conditioning unit for the new communication building. (E.S.B. 10905/53. Ten/7694.)*

City Treasurer's Department. Forty-eight 150 MVA, 6·6 kV vertical draw-out, switchboard cubicles and 12 class "D" 15 VA, 6·6 kV current transformers. (E.S.B. 11224/53. Ten/7693.)*

United States.—SEATTLE.—Purchasing Agent, City of Seattle. Four 230/196 kV 1,600 A, 3-pole, single-throw circuit breakers. (E.S.B. 10692/53. Ten/7659.)*

WENATCHEE, WASHINGTON.—21st December. Public Utility District No. 1, Chelan County. Equipment and material for a 20,000 kVA "packaged" substation. (E.S.B. 10735/53. Ten/7701.)*

PORTLAND, OREGON.—12th January. District Engineer, Corps of Engineers, U.S. Army. Fourteen turbine governing equipments with auxiliaries for 123,800 h.p. turbine unit, and two turbine governing equipments with auxiliaries for 18,800 h.p. turbine unit. (E.S.B. 10742/53. Ten/7700.)*

ORDERS PLACED

Cheltenham.—Highways Committee. Recommended. Improved lighting, Bath/Lincoln trunk road (amended tender, £10,842).—Revo Electric Co., Ltd.

Hertford.—Corporation. Recommended. Rewiring of 47 houses on the Bengeo estate (£1,175).—Eastern Electricity Board.

Houghton-le-Spring.—U.D.C. Electrical installations in 132 new houses (£3,658).—B. L. Oliver.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Anglesey.—C.P. school, Holyhead; L. C. Wakeman & Partners, quantity surveyors, 126, Hagley Road, Birmingham, 16.

Barking.—First section of scheme for municipal offices and town hall; E. R. Farr, town clerk, Town Hall.

Barrow-in-Furness.—Magistrates' court and central police station, and scheme for rebuilding public baths; J. N. Flitcroft, borough surveyor, Town Hall.

*Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

Bath.—Houses (52), Sham Castle Lane area; city engineer, Guildhall.

Bebington. — New town hall, in stages (£56,000); borough surveyor, Brackenwood, Bebington, Wirral.

Berkhamsted.—Dining hall and classroom block, Berkhamsted School; Tooley & Foster, architects, Midland Bank Chambers, Buckhurst Hill.

Bromsgrove. — Secondary modern school; Yorke, Rosenberg & Mardall, architects, 2, Hyde Park Place, London, W.2.

Cambridge.—First instalment of extensions to technical college; C. Phythian, clerk, Shire Hall, Cambridge.

Cardiff.—Extensions to Royal Infirmary; H. W. Fletcher, architect, 21, Dumfries Place.

Castle Donington. — Houses (104), Park Lane; F. Perks & Son, Ltd., Long Eaton, Notts.

Colwyn Bay.—Three blocks of three-storey flats on the Glyn estate; S. Powell Bowen, architect, Alliance House, Princes Drive.

Dewsbury.—Fire station; borough architect.

Dudley.—Houses (224) and flats (60), Saltwells estate; borough engineer, Council House.

Ealing. — Houses (40), Ashbourne Road, Hanger Hill estate; Haymills Houses, Ltd., Hanger Green, W.5.

Felling (Co. Durham). — Houses (162), Heworth Grange; U.D.C. housing architect.

Gateshead.—Factory additions, Team Valley Trading Estate, for Smith's Delivery Vehicles, Ltd.; Arthur & Kirkup, architects, 13, Swinburne Street.

Gloucester.—Extensions and alterations to Coney Hill Mental Hospital; T. F. Lawson, architect, Clarence Street.

Gloucestershire.—Secondary modern school at Mangotsfield and police stations at Patchway, Alveston, Hallen, and Olveston; Guy H. Davis, clerk to Council, Shire Hall, Gloucester.

Gosport.—Two-storey old people's homes for God's Port Housing Society; borough surveyor, Town Hall.

Great Yarmouth.—Central public library; borough surveyor, 15, Regent Street.

Guildford.—Factory; Keefe & Lewis, Ltd., Rodborough Buildings, Bridge Street.

Harlow.—Health centre; North East Metropolitan Regional Hospital Board, 11a, Portland Place, London, W.1.

Hyde.—Reconstruction of Public Baths, Union Street; borough surveyor, Greenfield Street.

Leeds.—Cow Close Secondary Modern School; Johns & Slater, architects, 32, Foundation Street, Ipswich. Dewsbury Road Secondary Modern School; Gollins, Melville & Partners, architects, 15, Manchester Square, London, W.1.

Leyton.—Works extensions, Church Road; Henry Kent (Bldrs.), Ltd., Beacon Road, S.E.13.

Llandrindod Wells.—Fire station, Tremont Road, for Breconshire and Radnorshire Joint Fire Brigade Committee; Scott & Redwood, architects, 5, Rodney Place, Clifton, Bristol, 8.

London.—New Cross.—Flats (30), Idonia Street; Halse & Sons, Ltd., 5, Chapel Hill, S.E.18.

Peckham.—Factory, Ormside Street; M. E. Bedwick, Ltd., 37, Lewisham Road, S.E.13.

Louth.—Houses (72), Eastfield Road estate; Vallance & Westwick, architects, Whit[illegible] Hart Chambers, Mansfield.

Middlesbrough. — R.C. secondary modern school at Town Farm (£135,000); P. R. Middleton, architect, Woodlands Road.

Newcastle-on-Tyne. — Rebuilding Lloyds Bank, Newgate Street; C. S. Errington, 46, Grainger Street, Newcastle.

Hotel, Coast Road, for J. Deuchar Ltd.; Marshall & Tweedy, Grainger Street.

New Forest. — Houses (58), Hythe and Totton, for R.D.C.; surveyor, Council Offices, Lyndhurst, Hants.

North Riding.—County primary school at Eastfield, Scarborough; W. W. Atkinson, architect, Gray's Inn, London, W.1.

Nottinghamshire.—Completion of county hall buildings, Trent Bridge, and erection of secondary modern schools at Southwell, Sutton-in-Ashfield and West Bridgford, and secondary technical schools at Bramcote Hills and Worksop; county architect, Trent Bridge, Nottingham.

Peterlee.—Factory; Alexander & Co., clothing manufacturers, Leeds.

Pewsey.—Houses (50); R.D.C. surveyor, Council Offices, Pewsey, Wilts.

Plymouth. — Shops and offices, Cornwall Street; Wakeham Bros., Ltd., Friary Yard, Knighton Road.

Ramsgate.—Library and community centre at Newington; borough engineer.

Reading.—Shops and flats, Shinfield Road; F. M. Gant Estates, Ltd., East Street.

St. Leonards-on-Sea.—Flats (40), Pevensey Road; N. E. A. Wyatt, architect, 2, Castle Hill Road, Hastings.

Sheffield.—Extensions at University; Gollins, Melvin & Partners, architects, 21, Russell Square, London, W.C.1.

Southampton. — Rebuilding business premises, 136-152, Above Bar; Tyrrell & Green, Ltd., general drapers, etc.

Stourbridge.—First part of scheme for College of Further Education; Frederick Gibberd, architect, 8, Percy Street, London, W.1.

Sunderland.—Additions to the Monkwearmouth and Southwick Hospital for Newcastle Hospital Board, "Dunira," Osborne Road, Newcastle-on-Tyne; P. H. Knighton, Board's chief architect.

Junior school, Castle View; borough architect, Grange House, Stockton Road.

Swansea.—T.A. centre, West Cross; Sir Percy Thomas & Son, architects, 10, Cathedral Road, Cardiff.

Wallsend.—Laboratory and offices, Stephenson Street, for Commercial Plastics Ltd.; William Stockdale, architect, 73, Howard Street, North Shields.

Extensions to Technical School (£10,000); county architect, County Hall, Newcastle-upon-Tyne.

Wellingborough. — Conversion of "Westlands" for use as old people's home (£12,950); county architect, Northampton.